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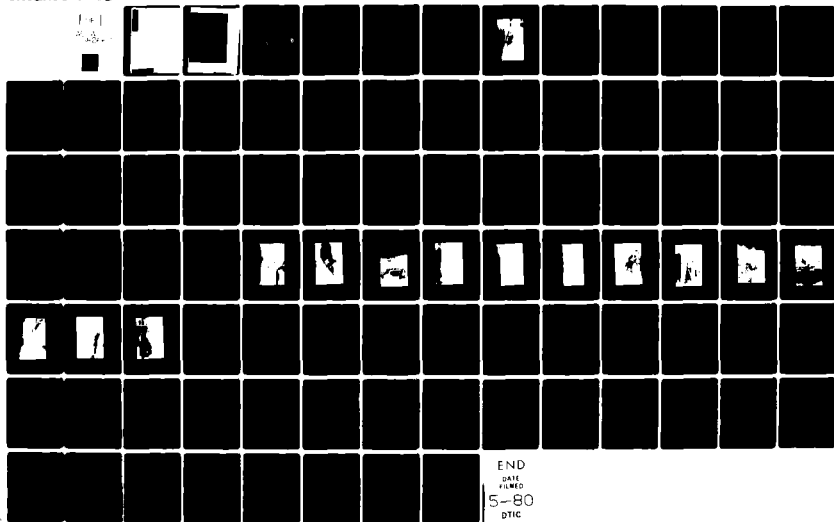
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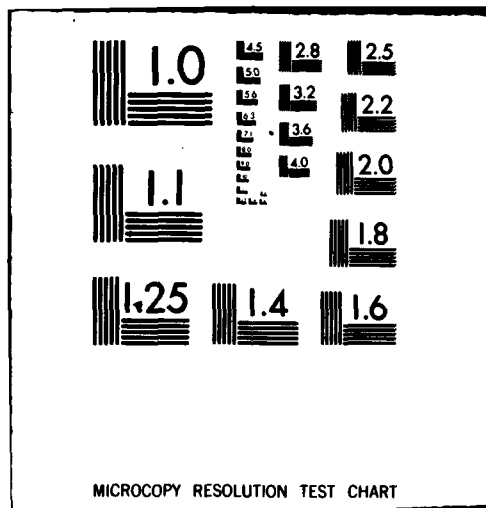
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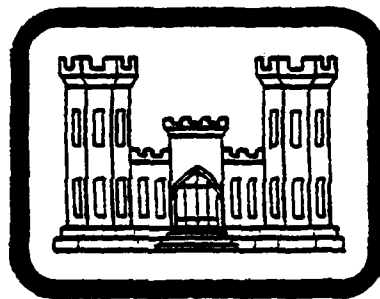
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SCS PA 476 (NDS-I.D. Number  
PA 00719, DER I.D. Number  
6-456),

DELAWARE RIVER BASIN,  
Tributary of Mill Creek, Berks County,  
Pennsylvania. Phase I Inspection Report,  
SCS PA 476  
BERKS COUNTY, PENNSYLVANIA

NDS I.D. NO. PA 00719  
DER I.D. NO. 6-456

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



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15) DACW 31-80-C-0018  
Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
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JANUARY 1980

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	SCS PA 476
County Located:	Berks County
State Located:	Pennsylvania
Stream:	Tributary to Mill Creek
Coordinates:	Latitude 40° 34.3' Longitude 75° 58.1'
Date of Inspection:	October 26, 1979

SCS PA 476 is owned and maintained by the Borough of Hamburg. The dam and reservoir are used as a flood control structure for the downstream town of Hamburg, Pennsylvania. The impoundment was designed by the United States Department of Agriculture, Soil Conservation Service (SCS), in 1963, and the structure was officially completed in December 1965.

The dam and its appurtenant facilities are considered to be in good condition. The dam is classified as an "Intermediate" size structure with a "High" hazard classification, consistent with its potential in the event of failure for extensive property damage and loss of life in Hamburg, Pennsylvania.

Calculations indicate that the existing spillway systems are capable of passing the Probable Maximum Flood (PMF) without overtopping. Therefore, the spillway system is considered to be "Adequate".

The visual inspection and review of available documentation indicates that the dam, foundation and its appurtenant structures are in good condition. The only items to be noted are the undesirable vegetation gaining a foothold on the embankment and the emergency spillway slope, and the slight damage to the crest by truck traffic.

Considering the overall good condition of the dam, the only recommendations made beyond routine maintenance of the dam are:

1. The woody vegetation on the right emergency spillway slope should be removed, at least below the elevation of the top of the dam.
2. Woody vegetation should be removed from the embankment.

3. Although damage to the dam crest is minor, consideration should be given to its protection. A gravel top would be sufficient.

Because of the location of the dam upstream of Hamburg, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents of the possibility of flooding. The Owner should also develop an operational and maintenance procedure to be used to insure that the dam is maintained in the best possible condition. The primary elements of the operational/maintenance procedure can be obtained from the Soil Conservation Service's "Watersheds and Conservation and Development Operations and Maintenance Handbook". It is important that individuals responsible for the maintenance and operation of the dam are aware of the written procedures.

*Mary F. Beck*

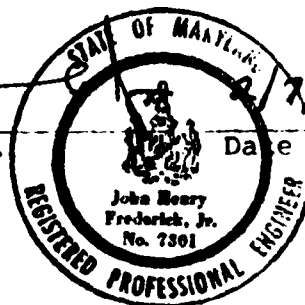
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Date

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*20 MAR 80*

Date





OVERVIEW  
SCS PA 476, BERKS COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
SCS PA 476  
NATIONAL ID NO. PA 00719  
DER NO. 6-456

SECTION 1  
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. SCS PA 476 Dam is a 46 foot high zoned earth embankment about 400 feet long with the emergency spillway at the right abutment. Plans and a cross-section of the dam are shown on Plates 2 and 3, Appendix E. An impervious core (Section 1) is constructed over a cutoff trench (also Section 1), both of which are composed of materials which were visually classified as silty sands (SM) and silt (ML). Subsequent laboratory classification of potential borrow materials includes sandy clay (CL) as Section 1 material. The upstream and downstream sections (Section 2) are constructed of on-site weathered rock which is classified as clayey, silty gravel (GC-GM). The cutoff trench and core have slopes of 1H:1V. The upstream embankment slope is 3H:1V with a ten foot wide berm at approximately elevation 501, the normal pool elevation. The downstream slope is 2.5H:1V and has a rock toe. The 15 foot wide embankment crest has a design settled elevation of 522.0. Both upstream and downstream slopes are protected with Crownvetch.

Embankment seepage is controlled by a trench drain near the downstream toe along the entire embankment length. A filter blanket and rock toe are also used, but only where the embankment is below elevation 501. Two drain pipes discharge through the impact basin walls at the downstream toe.

The principal spillway consists of a concrete drop inlet riser, 182 feet of 24 inch reinforced concrete pipe with

six anti-seep collars, and an impact basin. The reservoir drain, 40 feet of 12 inch corrugated metal pipe, has an inlet invert elevation of 488.5 and the riser weir elevation is 510.4. The outlet invert and impact basin end sill elevations are 476.1. Typical sections of the principal spillway are presented on Plates 6 through 8 in Appendix E. The emergency spillway located at the right abutment is a trapezoidal channel excavated through rock. The 30 foot wide level section is at elevation 516.

b. Location. The dam is located across a tributary of Mill Creek in Windsor Township, Berks County, Pennsylvania. The dam is located approximately 1,000 feet north of U.S. Route 22 (Interstate Route 78), approximately 1.3 miles northeast of Hamburg, Pennsylvania. The dam site and reservoir are located on USGS Quadrangle entitled, "Hamburg, Pennsylvania, Berks County", at coordinates N 40° 34.3' W 75° 58.1'. A regional location plan of the dam site is shown on Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 46 foot height.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life along Mill Creek in Hamburg, downstream of the dam.

e. Ownership. SCS PA 476 is owned and maintained by Hamburg Borough. All correspondence should be sent to Mr. Charles Clark, Hamburg Borough Manager, 31 North Third Street, Hamburg, Pennsylvania 19526.

f. Purpose of Dam. The purpose of this dam is flood control. This structure is one of three dams built in the Kaercher Creek Watershed to provide flood protection for the Borough of Hamburg. Water is also used for irrigation on the farm adjacent to the reservoir.

g. Design and Construction History. The Kaercher Creek Watershed project, composed of two flood control dams and one multi-purpose dam, was approved by Congress in 1962. The soils and foundation investigation took place in late 1963, and final construction drawings were prepared in early 1964, and construction began that summer. By December 1965, the dam was completed. The contractor was Feeser contractors of Schuylkill Haven, Pennsylvania. Construction records have reportedly been destroyed by SCS.

h. Normal Operating Procedures. Reservoir outflow is controlled by the principal and emergency spillways. Under normal conditions, water flows through an orifice in the

principal spillway at elevation 501.0. During a storm, excess water is first stored to elevation 510.4, the riser weirs elevation, and then stored up to elevation 516.0, the crest of the emergency spillway. Thereafter, water is discharged through the emergency spillway.

### 1.3 Pertinent Data.

A summary of pertinent data for SCS PA 476 is presented as follows.

a.	Drainage Area (square miles)	0.50
b.	Discharge at Dam Site (cfs)	
	Max Known Flood at Dam Site	Unknown
	At Design High Water	2,150
	At Top of Dam (existing conditions)	3,890
c.	Elevation (feet above MSL)	
	Top of Dam	
	Design	522.0
	Existing Condition	521.7
	Design High Water	520.0
	Emergency Spillway Crest	516.0
	Principal Spillway	
	Weir Crest	510.4
	Orifice (normal pool)	501.0
	Pond Drain Inlet	488.5
	Outlet Invert	476.1
d.	Reservoir Length (feet)	
	Length at Normal Pool	350
	Fetch at Normal Pool	350
	Length at Design High Water	935
	Fetch at Design High Water	935
e.	Storage (acre-feet)	
	Sediment/Normal Pool	6
	To Emergency Spillway Crest	59
	To Top of Dam (design)	102
f.	Reservoir Surface Area (acres)	
	Sediment/Normal Pool	1.3
	Design High Water	7.5
g.	Dam Data	
	Type	Zoned earth fill
	Volume	34,000 cu yds
	Length	400 feet

Maximum Height	46 feet
Top Width	15 feet
Side Slopes	
Upstream	3H:1V
Downstream	2.5H:1V
Cutoff	Impervious trench beneath dam center- line
Grout Curtain	None
h. Principal Spillway	
Intake	Two-stage concrete drop inlet riser, 24 inch conduit and im- pact basin
Elevations (feet above MSL)	
Weir Crest	510.4
Orifice	501.0
Pond Drain Inlet	488.5
Conduit Outlet and Impact Basin End Sill	476.1
i. Emergency Spillway	
Type	Trapezoidal grass-lined channel at right abutment
Width	100 feet
Side Slopes	2H:1V and 3H:1V
Elevation	30 foot wide level section at elevation 516.0

## SECTION 2 ENGINEERING DATA

### 2.1 Design.

a. Data Available. A summary of engineering data on SCS PA 476 is attached as Appendix B. Engineering data available for review is contained in a several hundred page design folder and an 11 page set of as-built plans on file at the SCS state office in Harrisburg. All of these records were prepared by the Soil Conservation Service.

b. Design Features. The principal design features of this dam are illustrated on the plans and profiles enclosed in Appendix E as Plates 2 through 8. A detailed description of the design features is also presented in Section 1.2, paragraph a, and pertinent data relative to the structure is presented in Section 1.3.

### 2.2 Construction.

Details of construction history are sketchy, and what is known is presented in Section 1.2, paragraph g. Any DER (Pennsylvania Department of Environmental Resources) records were unavailable for review, and storage space limitations have prevented the maintenance of SCS construction records.

### 2.3 Operational Data.

Operational records are not maintained. Water level measurements and rainfall records are not maintained within this watershed, although rainfall records are maintained at a wastewater treatment plant about 0.6 mile southwest of the dam. The station has been a National Weather Service reporting station since 1978.

### 2.4 Evaluation.

a. Availability. All engineering data evaluated and reproduced for this report were provided by SCS.

b. Adequacy. Design data included in the SCS files are considered adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of this data.

### SECTION 3 VISUAL INSPECTION

#### 3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix A, and are summarized and evaluated as follows. In general, the dam and its appurtenant facilities are in good condition. At the time of the inspection, water was flowing through the principal spillway preventing access into the riser and inspection of the discharge conduit.

b. Dam. During the visual inspection, there were no indications of distortion in alignment or grade that would be indicative of movement of the embankment or foundation. There were no surface cracks noted along the crest. Although the crest is well vegetated with Crownvetch and grass, truck traffic has rutted the crest slightly. The upstream slope is protected with Crownvetch and grass and is not riprapped along the normal pool level. The berm elevation is 500 on the downstream edge and 501, the normal pool elevation, on the upstream edge. Reeds and other wet type vegetation are growing on the berm at the water's edge. Significant erosion has not occurred on the embankment as a result of no riprap. No significant erosion was noted of either the upstream or downstream slopes although foot traffic has worn a path through the vegetation. Briers are becoming established on the downstream slope at the maximum section, as shown in Photograph No. 3, Appendix C. Woody vegetation is growing on the upstream slope near the crest and should be removed.

The vertical alignment was checked and found to be essentially in agreement with the post-construction survey. A low point of about 521.7 was noted near the left abutment. Junctions between the embankment and abutment and the embankment and spillway are judged to be good, with no excessive erosion or deterioration. There was no seepage observed along or beyond the toe of the dam. The embankment drains outlet through the impact basin wall. A small amount of clear water was flowing from the left drain. It is to be noted that there was a limited head of water behind the embankment at the time of the inspection.

#### c. Appurtenant Structures.

1. Principal Spillway. The riser is located within the upstream berm at the shoreline, as shown in Photograph No. 2, Appendix C. Exposed portions of the riser were inspected and evaluated to be in good condition with no signs of



excessive concrete deterioration, spalling or other structural deficiencies or defects. Inspection of the inside of the riser from the top of the riser through the access gate door disclosed a small amount of leachate visible on the inside of the riser at about normal pool elevation. The pond drain sluice gate located on the outside of the riser operates easily. The outlet channel was inspected and observed to be in good condition with no excessive erosion or bank undercutting. The impact basin, Photograph No. 3 in Appendix C, was found to be in good condition.

2. Emergency Spillway. The grass-lined emergency spillway at the right abutment, shown in Photographs No. 4 through 6, Appendix C, was inspected and found to be stable and in good condition. The emergency spillway has a very good vegetation cover, but with some year-old woody vegetation that should be cut. The right spillway slope has older Sumac which should be cut annually. Gullies have been cut through the right slope to facilitate surface drainage from the adjacent dirt road, as shown in Photograph No. 9, Appendix C, and Sheet 5a, Appendix A.

d. Reservoir. At the time of the inspection, the pond was at the sediment/normal pool elevation. The reservoir slopes are well vegetated to the water's edge. No significant amounts of debris were noted along the reservoir edge. There is a very small amount of sediment at the upper end, which has no effect on flood water storage.

e. Downstream Channel. As shown on Plate 1, Appendix E, Mill Creek flows south and southwest to Hamburg Borough. About 1,200 feet below the dam, the outflow from SCS PA 476 is joined by the discharge from SCS PA 477, a flood control dam in the adjacent valley. The confluence is shown in Photograph No. 10, Appendix C. About 800 feet downstream of the dam are two houses which would be damaged in the event of failure. A pumping station and wastewater treatment plant are located near the stream in the next 1.25 miles, at which point Mill Creek enters Hamburg and passes under homes and businesses, as shown in Photograph No. 11, Appendix C. SCS PA 476 is one of three dams designed and built to protect the Borough of Hamburg from flood water damage and, therefore, a "High" hazard classification is justified.

### 3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal spillway or emergency spillway. Interior portions of the principal spillway conduit could not be inspected due to flow

through the system. The dam and spillway systems are considered to be in good condition. There are only two items of preventive maintenance to be noted. Although truck traffic has not significantly damaged the crest, care should be taken to prevent significant damage. Woody vegetation on the embankment and sumac on the wall of the emergency spillway should be cut annually.

## SECTION 4 OPERATIONAL PROCEDURES

### 4.1 Procedures.

Operational procedures are discussed in Section 1.2. Operation of the dam does not require a dam tender. Under normal conditions, flow discharges through the orifice and through the 24 inch reinforced concrete conduit at the base of the embankment. Excess water is first stored to the riser weir elevation and then to the crest of the emergency spillway. According to the Owner's representative, water has never flowed over the emergency spillway.

### 4.2 Maintenance of the Dam.

The dam is maintained by the Borough of Hamburg who periodically check the embankment and remove woody vegetation.

### 4.3 Maintenance of Operating Facilities.

Maintenance of these facilities includes twice yearly inspection, operation and lubrication of the gate hoist system, and removal of debris from the reservoir area.

### 4.4 Warning Systems In Effect.

There is no written warning procedure for this dam. The Owner's representative indicated that they would notify the local Civil Defence unit in the event a hazardous condition developed.

### 4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities of SCS PA 476. In conclusion, it is noted that formal operational, maintenance and warning procedures should be developed and implemented as soon as practical. These procedures should include an inspection checklist which would include a list of items that should be checked during each inspection and repaired as necessary to insure proper performance of the structure.

## SECTION 5 HYDROLOGY/HYDRAULICS

### 5.1 Evaluation of Features.

a. Design Data. The complete folder of design calculations was reviewed and portions of this folder are presented in Appendix D.

The watershed is about 1.2 miles long, and 0.4 mile wide, having a total area of approximately 0.5 square mile. Elevations range from about 1,450 in the upper reaches of the watershed to 501 at normal pool elevation. The watershed is approximately 70 percent wooded and 30 percent open or farmland, with very little residential development. Residential development can be expected to progress slowly within the watershed.

In accordance with criteria established by Federal (OCE) Guidelines, the selected spillway design flood for this "Intermediate" size dam and "High" hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

b. Experience Data. There are no records of reservoir levels kept for this dam. Rainfall is measured at a wastewater treatment plant downstream of the dam and sent to the National Weather Service. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of the inspection, there were no conditions observed that would indicate a reduced spillway capacity during an extreme event. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix A and discussed in greater detail in Section 3.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping. The PMF inflow hydrograph and graphical flood routing are presented in Appendix D. Because of several slight differences between existing and design conditions, the spillway adequacy was reevaluated according to criteria established for this investigation. Calculations, according to current SCS criteria, TR 39, indicate an emergency spillway capacity of about 4,140 cfs at design conditions. Combined spillway capacities with the water at elevation 521.7, the existing top of the dam, is about 3,890 cfs, less than the 4,080 cfs determined according to the design graphical flood routing. Using the HEC-1, Dam Safety

Version, computer program to evaluate the inflow hydrograph yielded a peak inflow value of about 1,545 cfs. The computer flood routing disclosed a maximum water elevation of about 519.2 feet, less than the top of the dam under existing conditions. Therefore, the spillway systems for this dam are considered "Adequate" as the dam will pass the PMF without overtopping.

e. Downstream Conditions. About 800 feet below the dam are two houses subject to damage in the event of dam failure. In the next 500 feet the stream passes under Route 22 and joins with the outflow from SCS PA 477, a flood control dam in the adjacent watershed. In the next 1.25 miles is a pumping station and wastewater treatment plant built adjacent to the stream and subject to damage in the event of dam failure. In Hamburg, the stream flows under houses and businesses; see Photograph No. 11, Appendix C. It is apparent, merely by comparing the relative sizes of the stream channel through Hamburg and the emergency spillway, that property damage would occur during an extreme event, and it is judged that failure during the PMF would significantly increase property damage and loss of life.

## SECTION 6 STRUCTURAL STABILITY

### 6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of existing or pending embankment instability. Upstream and downstream slopes appeared stable and in good condition, with some briars gaining foothold on the downstream slope. There were no exterior signs or other evidence to indicate that the internal drainage systems were not operating properly.

Exposed portions of the principal spillway were inspected and judged to be in good condition. The pond drain gate hoist was operated and seats completely. The grass-lined emergency spillway was assessed to be in good condition, with no signs of sloughing, excessive erosion or deterioration. Excessive woody vegetation was noted on the right emergency spillway slope.

b. Design and Construction Data. Design documentation is very complete as a several hundred page design folder prepared by the Soil Conservation Service was available and reviewed for this investigation. Data included in these files are a soils and foundation report including permeability tests, shear strength results and sediment analysis, results of embankment stability calculations, as well as structural calculations for the principal spillway. Included in the design folder is a complete set of hydrologic and hydraulic calculations and a complete set of specifications and a material quantity estimate. Other design documents reviewed included an 11 sheet set of drawings prepared by SCS and stamped "as-built".

A stability analysis of the embankment was performed by SCS using the Swedish circle method on the upstream slope for full rapid drawdown conditions, and using both a wedge analysis and infinite slope analysis on the downstream slope. Soil strength parameters for the core (Section 1) material were determined from one consolidated-undrained triaxial compression test series on compacted borrow soil from the emergency spillway. Strength parameters for the shell (Section 2) material were selected based upon the results of two test series on similar material used for SCS PA 477 Dam in the adjacent watershed. It was assumed that the foundation materials had sufficient strength to prevent a failure arc from passing through the embankment.

The reported results of the stability analysis are as follows:

<u>Slope</u>	<u>Condition</u>	<u>Method</u>	<u>Factor of Safety</u>
Upstream	Rapid Drawdown	Swedish Curve	1.79
Downstream	Dry	Infinite Slope	1.36
Downstream	Unknown	Wedge Analysis	2.1

The recommended minimum allowable factors of safety in accordance with Corps of Engineers EM 1110-2-1902 are 1.2 for the upstream slope under rapid drawdown conditions and 1.5 for the downstream slope under steady seepage conditions. The recommended minimum factor of safety in accordance with current SCS criteria (TR-60) for an infinite slope analysis is 1.1.

It is noted that the stability analysis is based upon very limited soil testing. It is also noted that the analysis was based upon an assumed embankment height of 38 feet rather than the actual maximum embankment height of 46 feet. On the conservative side, however, the stabilizing upstream berm at elevation 501 was not considered in the analysis; the design high water level of elevation 520.0 was used instead of the highest principal spillway crest elevation of 510.4, as specified by SCS criteria in TR-60; and relatively high factors of safety were computed. Therefore, overall it is concluded that the stability of the embankment is adequate.

Principal features of this structure were extracted from the drawings and calculations, and are presented in Appendix E and D, respectively. Progress reports prepared by the SCS resident engineer and inspection reports prepared by representatives of the Pennsylvania Department of Environmental Resources were not available for review. Construction documentations prepared by the SCS resident engineer reportedly no longer exist.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. There are no reports nor is there any evidence that modifications were made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it is considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. As the static stability analysis resulted in a minimum factor of safety of 1.79 during rapid drawdown, the most critical loading condition, it can be assumed that seismic stability requirements are satisfied.

SECTION 7  
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection and review of design documentation indicate that the dam, foundation and appurtenant structures of SCS PA 476 are in good condition.

Hydrologic and hydraulic computations presented in Appendix D indicate the structure will pass the Probable Maximum Flood without overtopping. Therefore, the spillway systems of this structure are considered to be "Adequate". In the event that high flows are passed through the emergency spillway, significant property damage is still likely to occur along Mill Creek, particularly in the Borough of Hamburg. In the event the dam fails while retaining a significant quantity of water, extreme property damage and loss of life would be expected, thus justifying the "High" hazard classification.

b. Adequacy of Information. Information available for this investigation, when combined with the visual inspection, was sufficiently adequate to evaluate the structural and hydraulic aspects of the dam.

c. Urgency. It is recommended that the suggestions presented in Section 7.2 be implemented during routine maintenance of the structure, which should be not less than at least once a year.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following steps be taken.

1. The woody vegetation on the right emergency spillway slope should be removed, at least below the elevation of the top of the dam.
2. Woody vegetation should be removed from the embankment.
3. Although damage to the dam crest is minor, consideration should be given to its protection. A gravel top would be sufficient.

b. Operation and Maintenance Procedures. Because of the location of the dam and the potential for extreme property damage and possible loss of life in the event of failure, a formal procedure of observation and warning during periods of



high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents that high flows are expected and provisions for evacuating these people in the event of an emergency. In addition, a written operation and maintenance procedure should also be developed to insure that all items are carefully inspected on a regular basis and maintained in the best possible condition.

The "Operations and Maintenance" manual prepared by SCS can form the basis for the specific procedures for SCS PA 476. It is recommended that operational procedures provide for a period of observation during and following impoundment of significant quantities of water behind the embankment. These observations should include monitoring discharge from the embankment drainage system and looking for sources of uncontrolled seepage. It is important that individuals responsible for the maintenance and operation of the dam are aware of the written procedures.

**APPENDIX**

**A**

CHECK LIST  
VISUAL INSPECTION  
PHASE I

Sheet 1 of 11

Name Dam SCS PA 476 County Berks State Pennsylvania National ID # PA 00219  
Type of Dam Earth Hazard Category High  
Date(s) Inspection 10/26/79 Weather Partly cloudy Temperature 50's

Pool Elevation at Time of Inspection 501.2 M.S.L. Tailwater at Time of Inspection 476.24 M.S.L.

Inspection Personnel:

Raymond S. Lambert (Geologist)

Mary F. Beck (Hydrologist)

(12/11/79)

Arthur H. Drinoff (Civil)

Vincent McKeever (Hydrologist)

Mary F. Beck

Recorder

Remarks:

Mr. Gary Emmanuel, DER, Norristown, accompanied the inspection team.

Mr. Clark, Hamburg Borough Manager, was on site and provided assistance to the inspection team. Two Borough employees also were on site to operate the pond drain gate.

CONCRETE/MASONRY DAHS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

# CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
PARALLEL JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

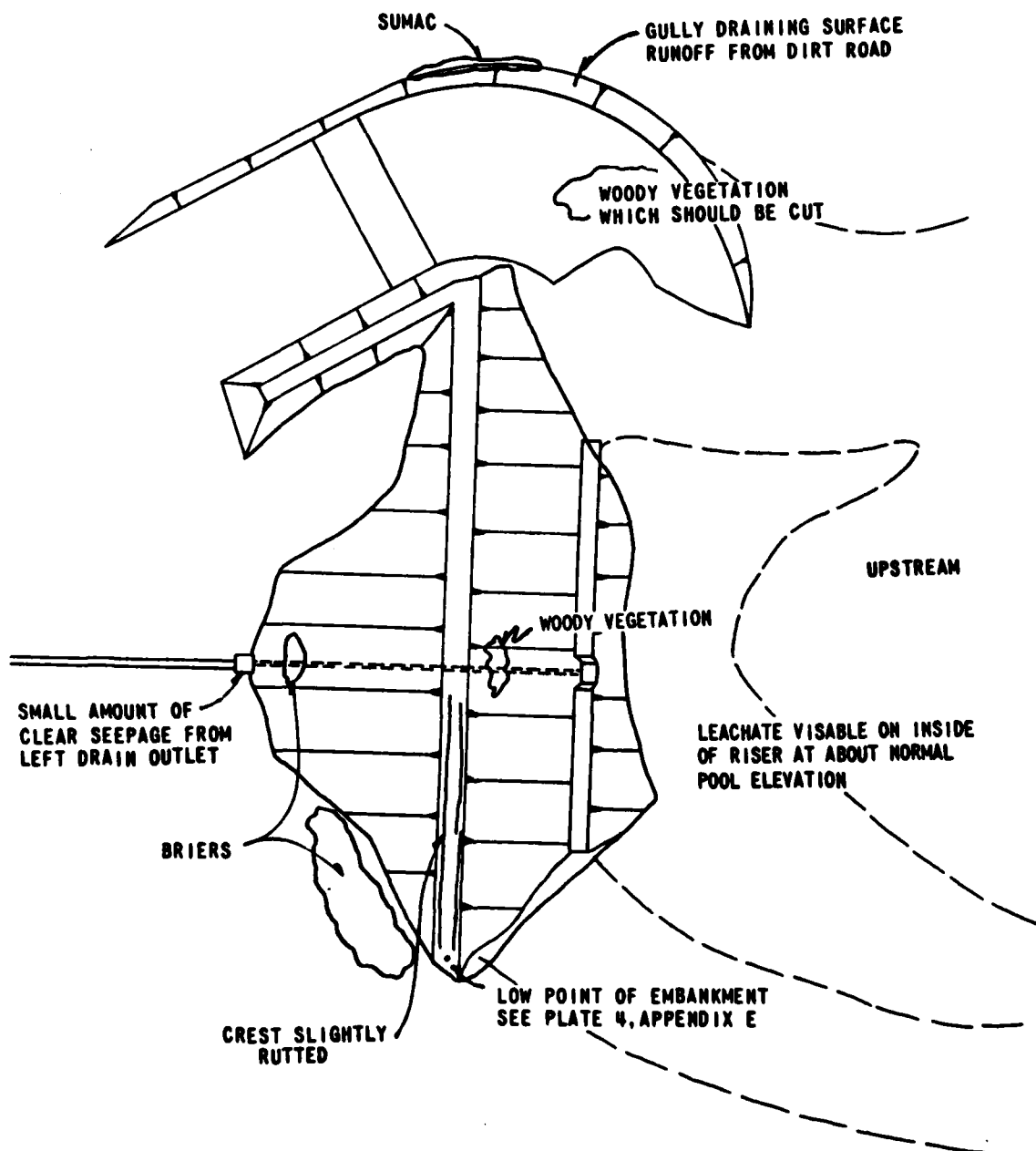
Sheet 4 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
<u>SURFACE CRACKS</u>	None observed. Although the crest is well vegetated with <i>Crownvetch</i> and grass, truck traffic has rutted the crest slightly.	
<u>UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE</u>	None observed.	
<u>SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES</u>	No significant erosion observed, although foot traffic has worn a path through the vegetation. Briers are becoming established on fill. Woody vegetation was noted on the upstream slope near the crest.	
<u>VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST</u>	The horizontal alignment is good. The survey disclosed an apparent low point near the left abutment of about 521.7 feet (design top of dam is 522.0 feet). See Plate 3, Appendix E.	
<u>RIPRAP FAILURES</u>	None observed, riprap limited to the dike between emergency spillway and embankment.	

EMBANKMENT

Sheet 5 of 11

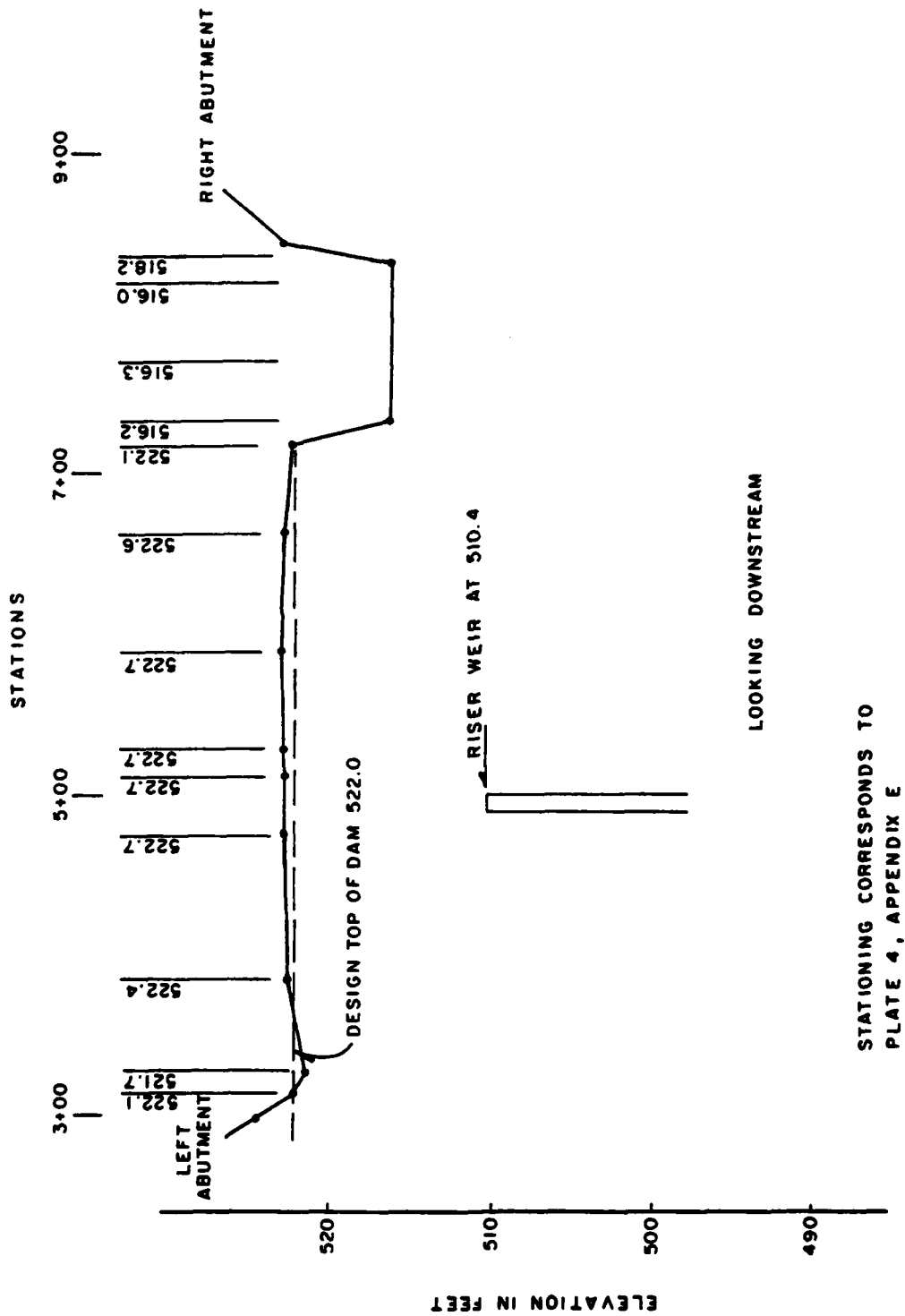
<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.	
ANY NOTICEABLE SEEPAGE	None observed.	
STAFF GAGE AND RECORDER	None	
DRAINS		Embankment drains outlet through impact basin wall, small amount of clear water flowing from left drain.



FIELD OBSERVATION PLAN  
SCS PA 476

SHEET 5A OF 11





STATIONING CORRESPONDS TO  
PLATE 4, APPENDIX E

FIELD OBSERVATION PROFILE  
SCS PA 476

SHEET 5B OF 11

PRINCIPAL SPILLWAY  
OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed, outlet conduit through dam could not be inspected.	
INTAKE STRUCTURE	Concrete appears in good condition, small amount of leachate visible on inside of riser at about normal pool elevation.	
OUTLET STRUCTURE	Concrete appears in good condition.	
OUTLET CHANNEL	Good condition.	
EMERGENCY GATE	Pond drain gate located outside of riser operates easily.	

EMERGENCY SPILLWAY  
UNGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

**CONTROL SECTION**

*Vegetated control section in good condition.*

**APPROACH CHANNEL**

*Has a very good vegetation cover, some year-old woody vegetation should be cut. The right spillway slope has older sumac which should be cut. Gullies have apparently been cut through the right slope to facilitate surface drainage from the adjacent dirt road.*

**DISCHARGE CHANNEL**

*See above.*

**BRIDGE AND PIERS**

*None*

GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE STILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PILKS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

# INSTRUMENTATION

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION

DOCUMENTATION/SURVEYS

None

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

RESERVOIR

Sheet 10 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

SLOPES

*The reservoir side slopes are moderate to steep and well vegetated to water's edge with grass and trees.*

SEDIMENTATION

*Very small amount of sedimentation at upper end, has no effect on flood water storage.*

# DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

## CONDITION

(OBSTRUCTIONS,  
DEBRIS, ETC.)

For about 300 feet below the dam, the channel is about five feet wide, four feet deep with side slopes of about 2H:1V. A one-quarter acre pond is 300 feet downstream of the dam. The channel is in good condition with no significant obstruction or debris.

## SLOPES

The valley gradient is about 0.03.

## APPROXIMATE NO. OF INHABITANTS AND POPULATION

About 800 feet downstream of the dam are two houses which would be damaged in the event of failure. There is a pumping station and sewage treatment plant built near the stream in the next 1-1/4 miles before Mill Creek enters Hamburg and passes under homes. See Photograph 11, Appendix C.

**APPENDIX**

**B**



CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION  
PHASE I

NAME OF DAM SCS PA 476  
ID # PA 00719

ITEM	REMARKS	Sheet 1 of 4
------	---------	--------------

AS-BUILT DRAWINGS	Drawings presented in Appendix E are "As-Built" drawings.	
-------------------	---	--

REGIONAL VICINITY MAP	See Plate 1, Appendix E.	
-----------------------	--------------------------	--

CONSTRUCTION HISTORY	See Section 1.2 of text.	
----------------------	--------------------------	--

TYPICAL SECTIONS OF DAM	See Appendix E.	
-------------------------	-----------------	--

OUTLETS - PLAN	}	See Appendix E.
DETAILS		
CONSTRAINTS		
DISCHARGE RATINGS		See Appendix D.

RAINFALL/RESERVOIR RECORDS	No reservoir water level records are maintained. A National Weather Service reporting station is located at treatment plant about 0.6 mile southwest of the dam.
----------------------------	--

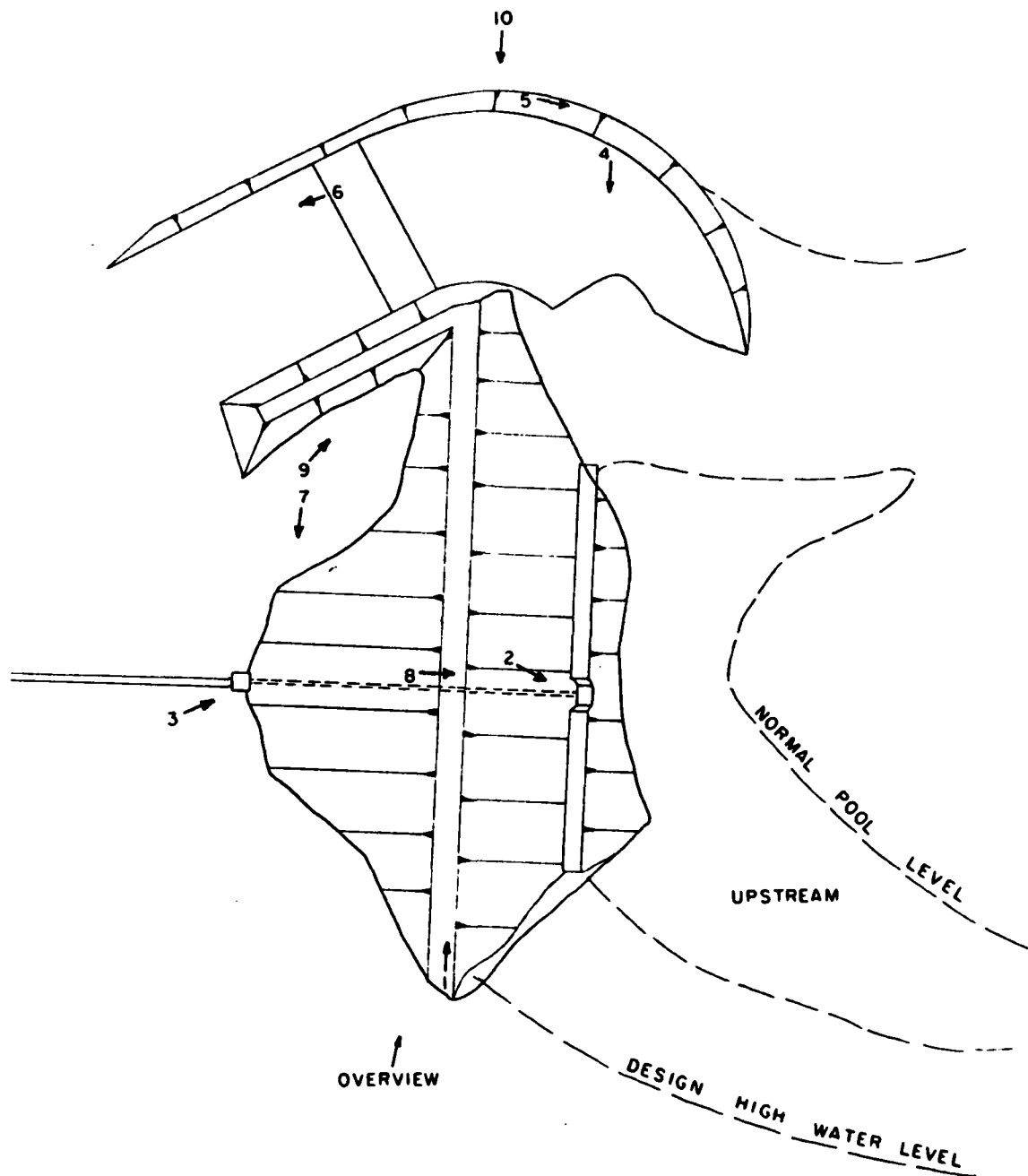
ITEM	REMARKS
DESIGN REPORTS	<i>See discussion in Section 2 of text.</i>
GEOLOGY REPORTS	<i>See Appendix F.</i>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<i>See discussions in Sections 5 and 6 of text.</i>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<i>Complete records in SCS files.</i>
POST-CONSTRUCTION SURVEYS OF DAM	<i>A final crest profile survey was performed. Data is presented on Plate 3, Appendix E.</i>
BORROW SOURCES	<i>Data located on SCS drawings.</i>

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	All pertinent modifications are noted on "As-Built" drawings presented in Appendix E.
HIGH POOL RECORDS	None
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None maintained.

ITEM	REMARKS
SPILLWAY PLANS	
SECTIONS	See Appendix E for details.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E for details.
MISCELLANEOUS	<ol style="list-style-type: none"> <li>1. Design Folder prepared by SCS.</li> <li>2. 12 sheet set of "As-Built" drawings prepared by SCS.</li> </ol>

**APPENDIX**

**C**



PHOTOGRAPH LOCATION PLAN  
SCS PA 476

PLATE C-1



VIEW OF CREST SHOWING DENSE VEGETATION.

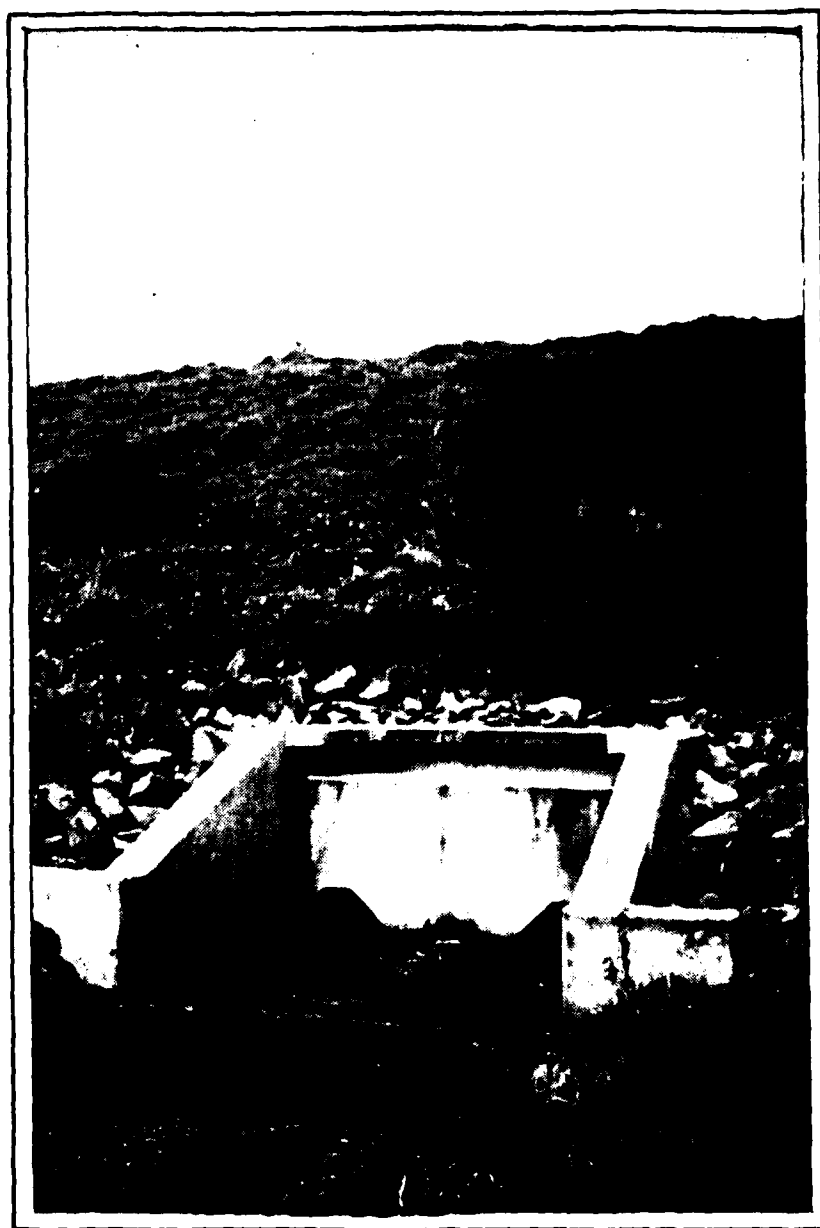
PHOTOGRAPH NO. 1



VIEW OF RISER. NOTE WOODY VEGETATION  
ON UPSTREAM SLOPE IN LOWER RIGHT OF  
PICTURE.

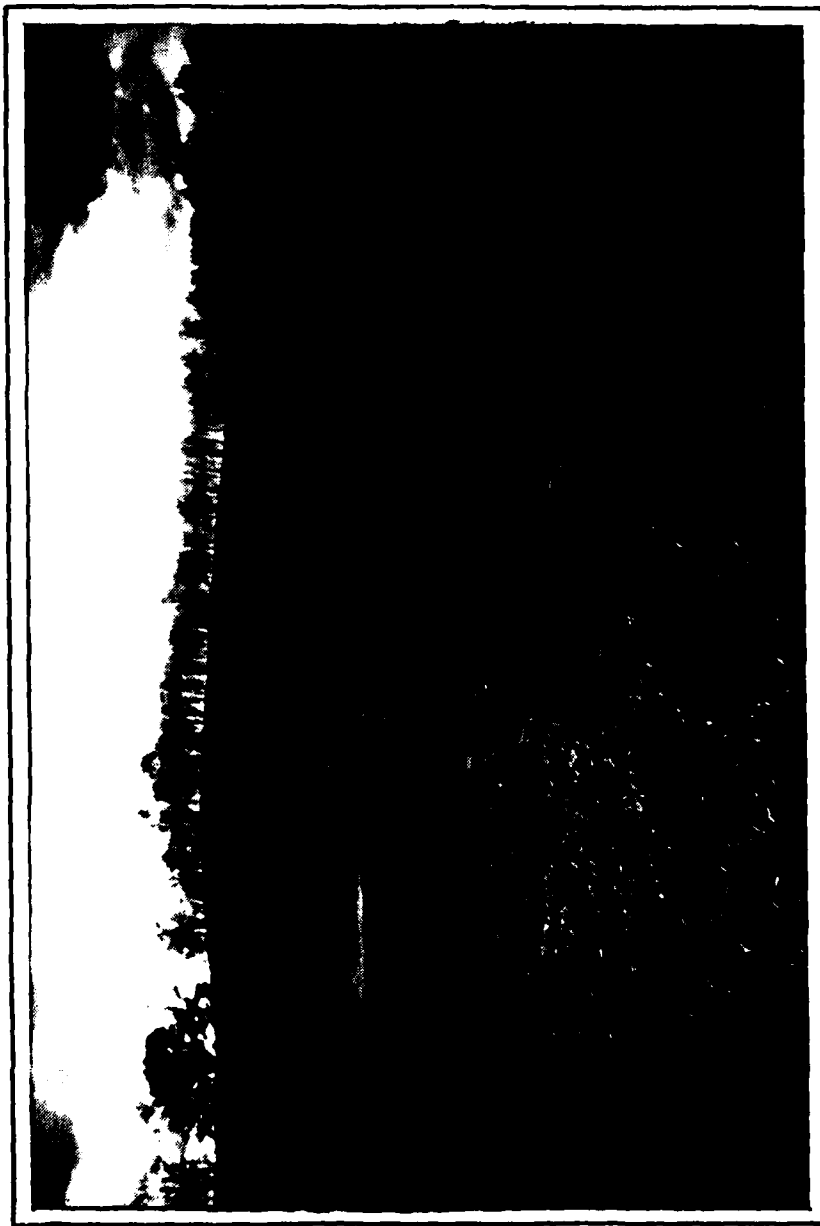
PHOTOGRAPH NO. 2





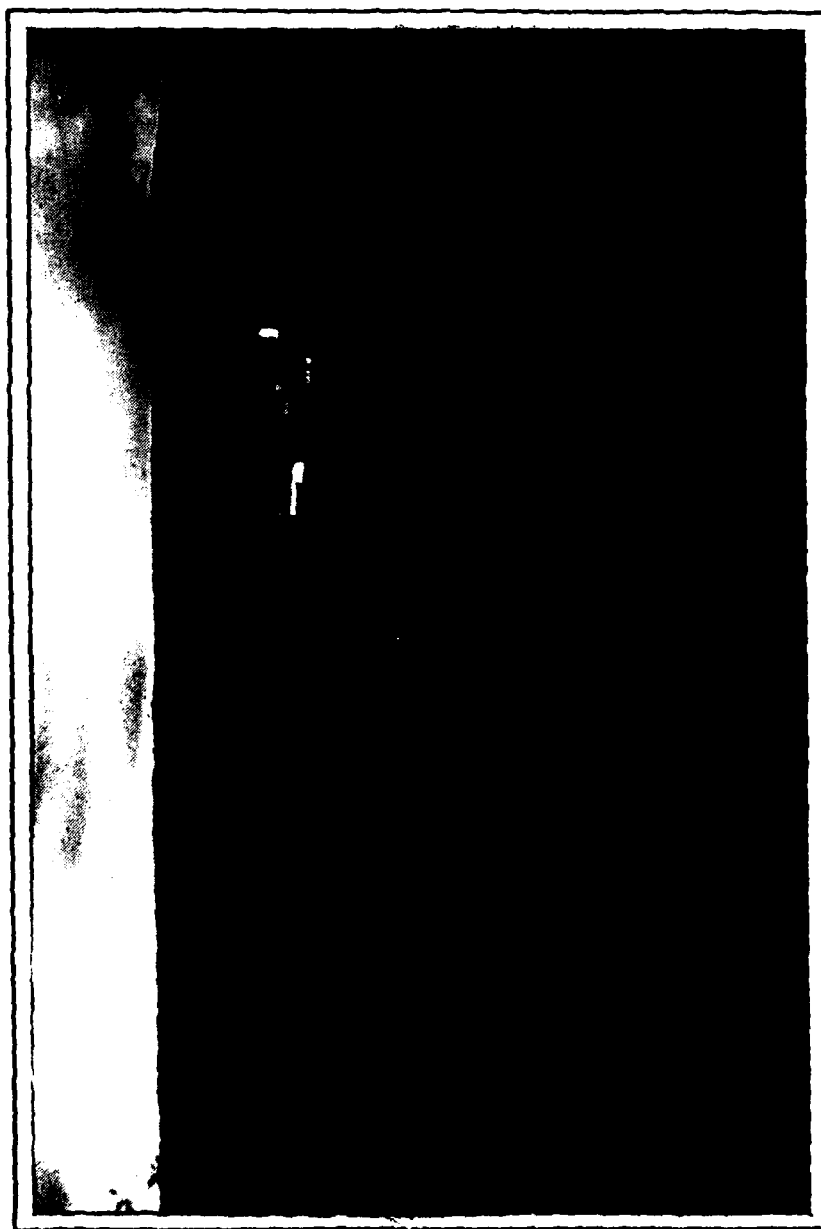
IMPACT BASIN AT DOWNSTREAM TOE. NOTE  
WEEDS AND BRIERS ON DOWNSTREAM SLOPE.

PHOTOGRAPH NO. 3



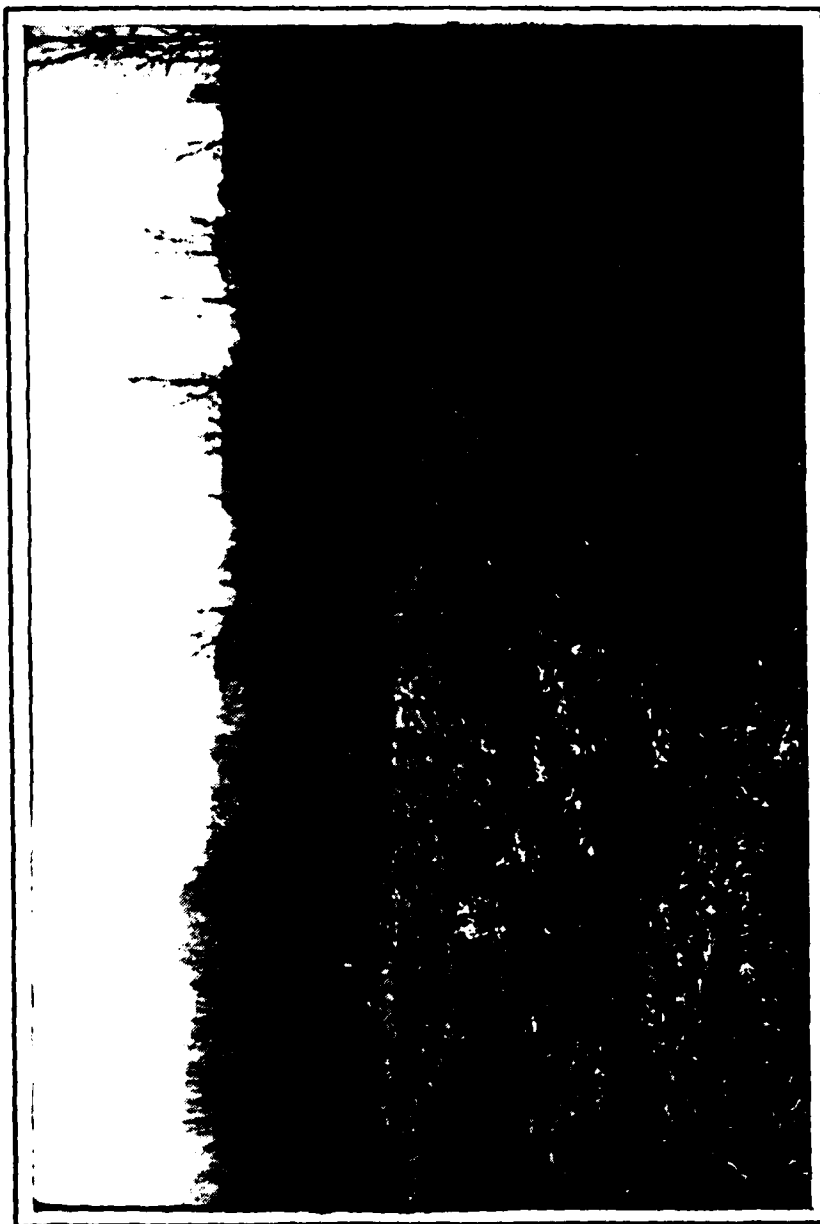
VIEW OF EMERGENCY SPILLWAY LOOKING  
UPSTREAM. TYPICAL OF CONDITION OF  
ENTIRE EMERGENCY SPILLWAY.

PHOTOGRAPH NO. 4



VIEW OF EMERGENCY SPILLWAY LOOKING  
UPSTREAM. NOTE SUMAC ON SLOPE.

PHOTOGRAPH NO. 5



VIEW OF EMERGENCY SPILLWAY LOOKING  
DOWNSTREAM. TAKEN IN DECEMBER.

PHOTOGRAPH NO. 6



OVERALL VIEW OF DOWNSTREAM SLOPE.  
NOTE PATCHES OF WEEDS.

PHOTOGRAPH NO. 7



VIEW SHOWING WOODY VEGETATION ON  
UPSTREAM SLOPE.

PHOTOGRAPH NO. 8



VIEW OF JUNCTION BETWEEN DIKE  
AND EMBANKMENT SHOWING STAND OF  
BRIERS.

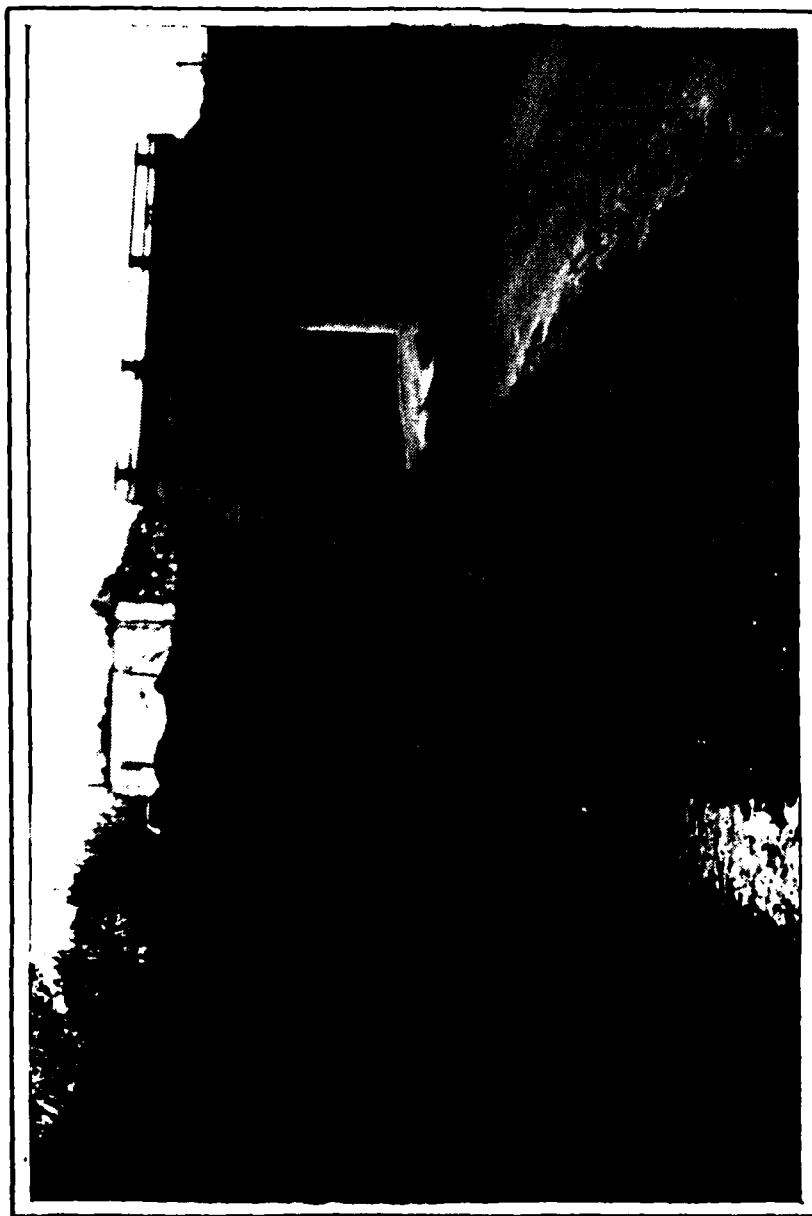
PHOTOGRAPH NO. 9



VIEW OF GULLY DRAINING SURFACE  
RUNOFF FROM DIRT ROAD INTO  
EMERGENCY SPILLWAY.

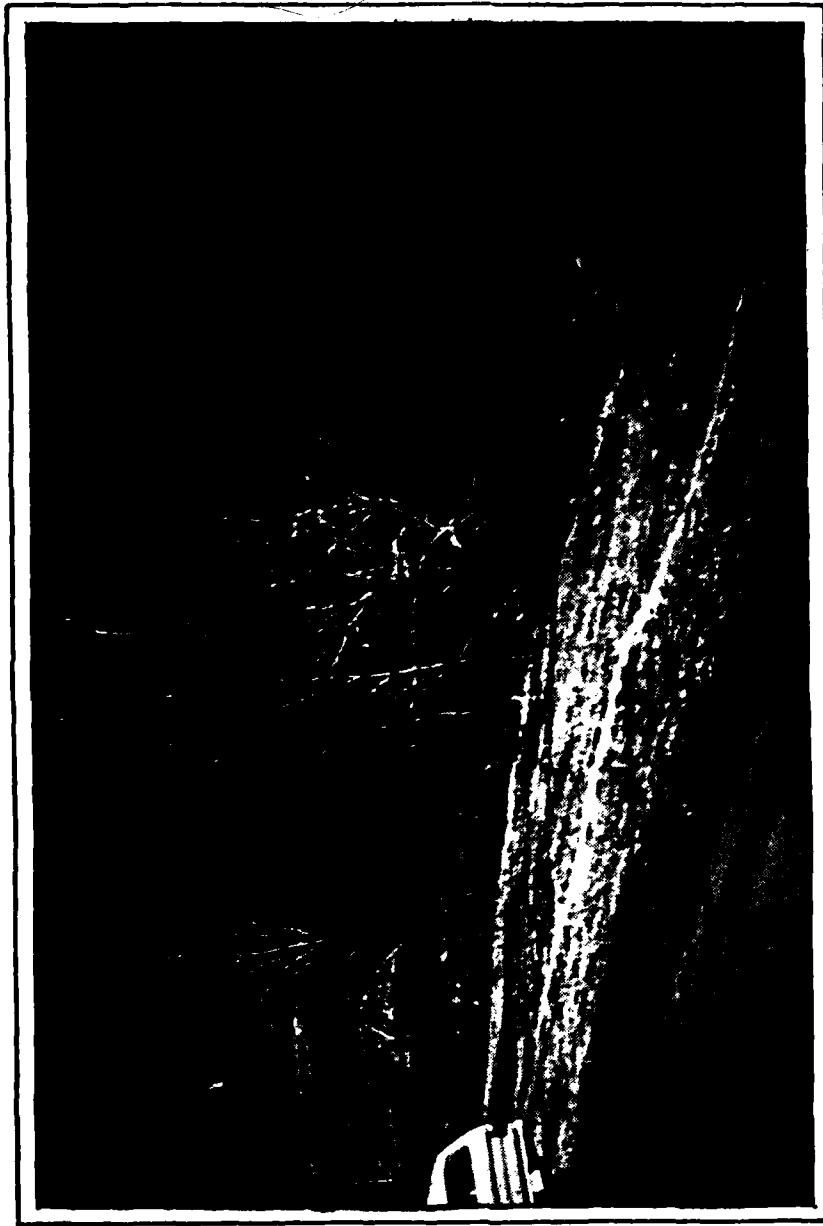
PHOTOGRAPH NO. 10





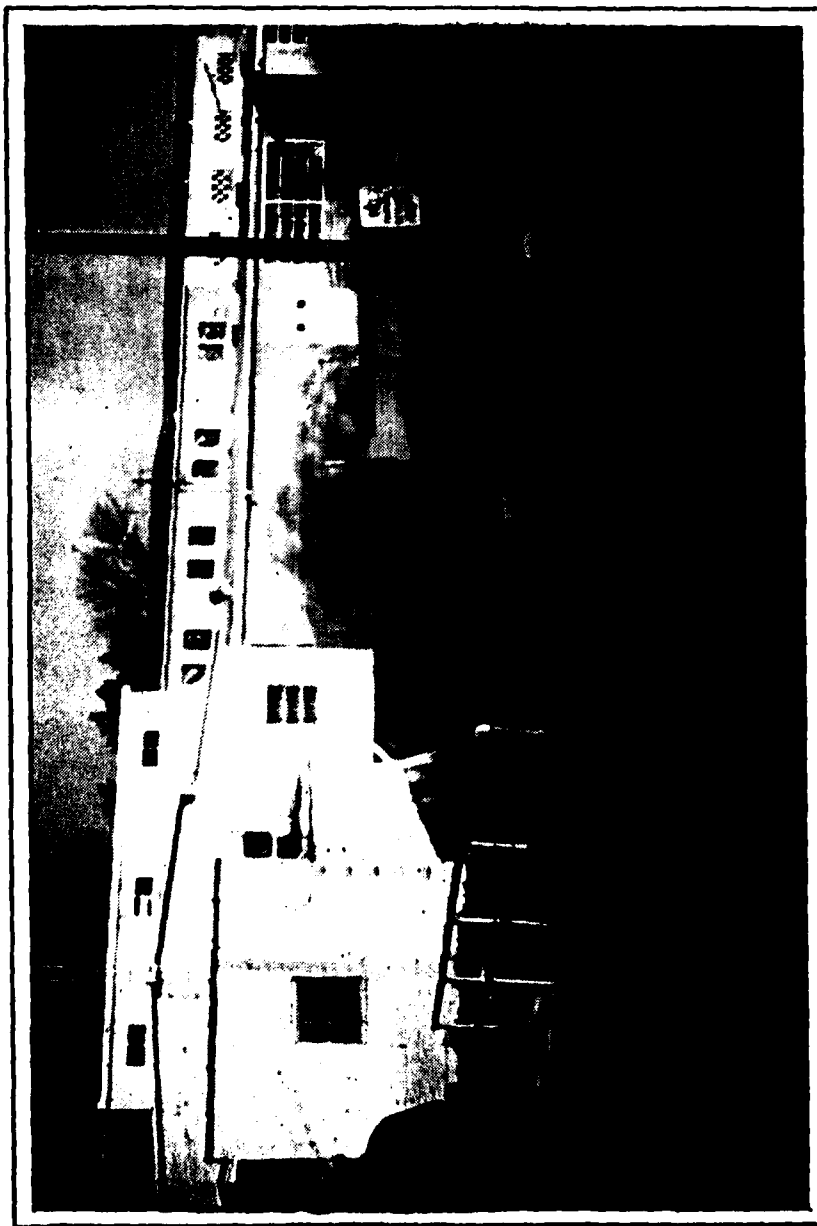
CULVERT UNDER ROUTE 22.

PHOTOGRAPH NO. 11



JUNCTION OF DOWNSTREAM CHANNELS OF  
SCS PA 476 and SCS PA 477.

PHOTOGRAPH NO. 12



TYPICAL VIEW OF DOWNSTREAM DAMAGE  
CENTER IN HAMBURG, PENNSYLVANIA.

PHOTOGRAPH NO. 13

**APPENDIX**

**D**

SCS PA 476  
CHECK LIST  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Approximately 70 percent wooded and 30 percent open farm land.  
ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 501.0 feet. (6 Acre-Feet).  
ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 522.0 ft. design (102 Acre-Feet).  
ELEVATION MAXIMUM DESIGN POOL: 520.0 feet Design High Water.  
ELEVATION TOP DAM: 522.0 feet design (521.7 existing, see Plate 4, Appendix D).  
EMERGENCY SPILLWAY:

- a. Elevation 516.0 feet.
- b. Type Trapezoidal channel excavated through rock.
- c. Width 100 feet.
- d. Length About 300 feet.
- e. Location Spillover Right abutment.
- f. Number and Type of Gates None

## PRINCIPAL SPILLWAY

- a. Type Concrete two stage riser, 24-inch conduit and impact basin.
- b. Location At maximum section.
- c. Entrance inverts Weir crest at 510.4 feet; orifice at 501.0 feet.
- d. Exit inverts 476.1 feet.
- e. Emergency draindown facilities Inlet at 488.5 feet.

## HYDROMETEOROLOGICAL GAGES:

- a. Type Rain gage.
- b. Location Treatment plant about 0.6 mile southwest of dam.
- c. Records A National Weather Service reporting station since 1978.

MAXIMUM NON-DAMAGING DISCHARGE: Not determined.

HEC-1, REVISED  
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quadrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputted and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MFB DATE 12/7/79 SUBJECT \_\_\_\_\_ SHEET 3 OF 11  
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_ SCS PA 476 JOB No. \_\_\_\_\_  
\_\_\_\_\_ Hydrology / Hydraulics \_\_\_\_\_

### Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed.
2. The size classification is "Intermediate" based on its 46ft. height and its 102 Ac-Ft total storage capacity.
3. The spillway design storm, based on size and hazard classification, is the Probable Maximum Flood (PMF).

### Hydrology and Hydraulic Analysis

1. Design data - the H&H section of the design folder was available for review. The dam was designed as a class C structure, i.e., the spillway design flood is the PMF. The PMF inflow hydrograph and flood routing were determined according to procedures in the SCS National Engineering Handbook, Sections 4 & 5. The original graphical flood routing is included as sheet 11. Because of several changes between the design flood routing and existing conditions or criteria, the spillway adequacy is evaluated by criteria established for this investigation.

#### 2. Evaluation -

##### PMF inflow hydrograph

Drainage area - 0.50 sq miles, was measured from the current USGS map and agrees with the original design value.

Rainfall - ref. Hydrometeorological Report 33

200 sq mile - 24 hr PMP = 23.0 inches  
10 sq mile - 6 hr PMP = 25.99 inches  
10 sq mile - 12 hr PMP = 20.29 inches  
10 sq mile - 24 hr PMP = 30.36 inches  
10 sq mile - 48 hr PMP = 32.66 inches

for zone 6

Inyden's hydrograph parameters,  $C_p$  &  $C_s$

$C_s = 1.35$   
 $C_p = 0.40$  } from correlation studies by Corps of Engineers, Baltimore District for zone 6.

MEB DATE 12/4/79  
HKB BY AMD DATE 12/13/79

SUBJECT  
SCS PA 476  
Hydrology / Hydraulics

SHEET 4 OF 11  
JOB No.

$L = 1.32 \text{ miles}$  } from USGS map  
 $L_{ca} = 0.59 \text{ miles}$  }

$$\begin{aligned} t_p &= C_d (L \cdot L_{ca})^{0.3} \\ &= 1.95 (1.32 \cdot 0.59)^{0.3} \\ &= 1.25 \end{aligned}$$

✓

#### Reservoir routing

Stage-Storage - original design curve was spot checked against the plan and found adequate. The curve from the design folder is enclosed as sheet 5.

Stage-Discharge - calculations for orifice, weir and pipe flow were reviewed and judged adequate, sheet 6. (although the orifice invert was lowered to 501.0 ft). The design of the emergency spillway was altered, one side slope is 2H:1V instead of 3H:1V. The spillway capacity was evaluated according to current SCS criteria, TR-39.

Total head forcing flow in emergency spillway,  $H_p$ , is 6.0 ft (design value).

Critical specific energy,  $H_{ec}$ , is about 5.35 ft.

ES-171, sheet 2.

$Q_c$ , critical discharge for  $h = 100 \text{ ft}$ ,  $n = 0.04$ ,  $Z = 0$  is about 3800 cfs. For  $Z = 2.5$

$$\begin{aligned} Q_c &= \left[ \frac{1.54 + 2.5 H_{ec}}{1.50} \right] Q_c \\ &= \left[ \frac{1.54 + 2.5 \cdot 5.35}{1.50} \right] 3800 \\ &= 4139 \text{ cfs.} \end{aligned}$$

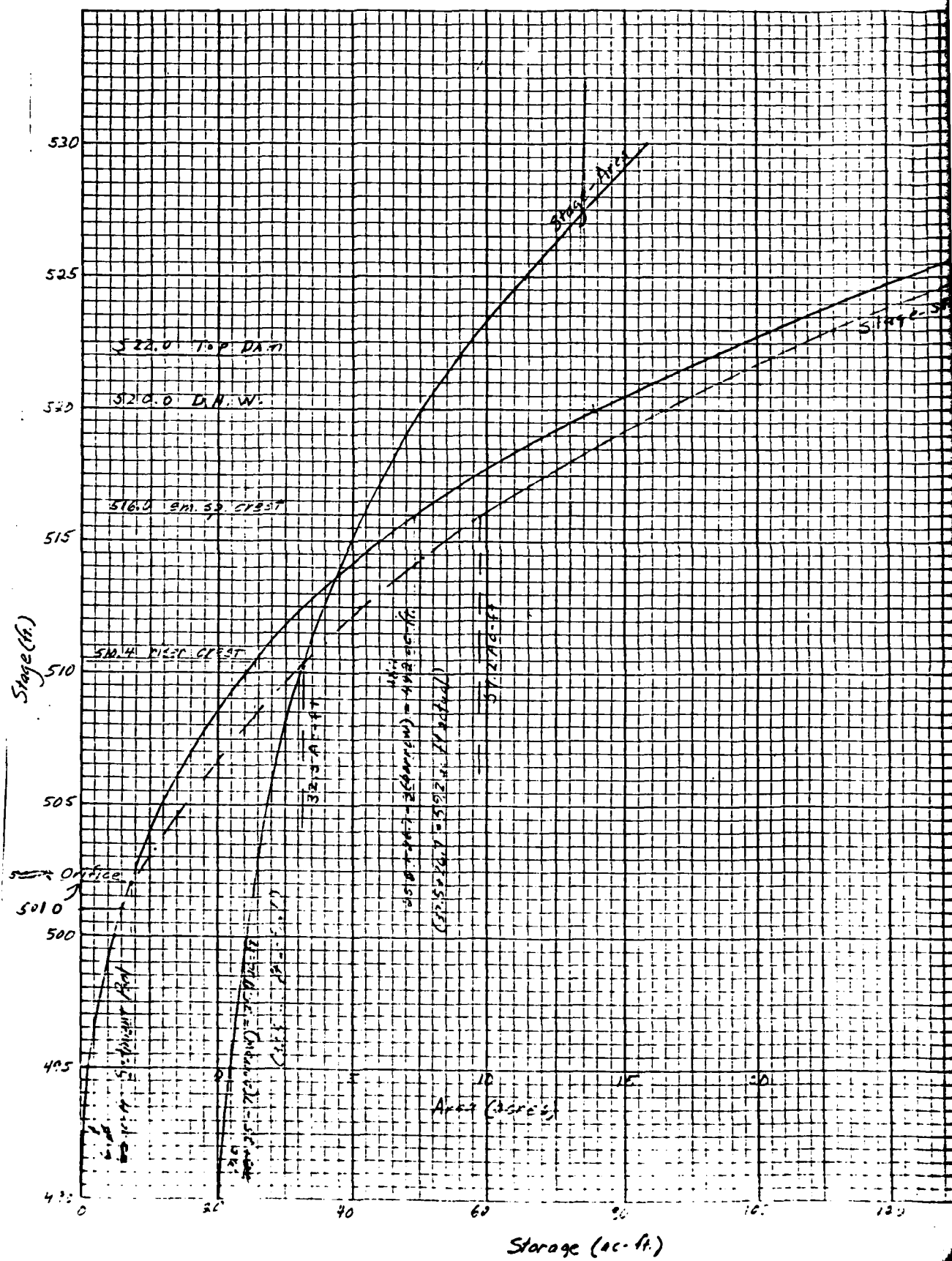
✓

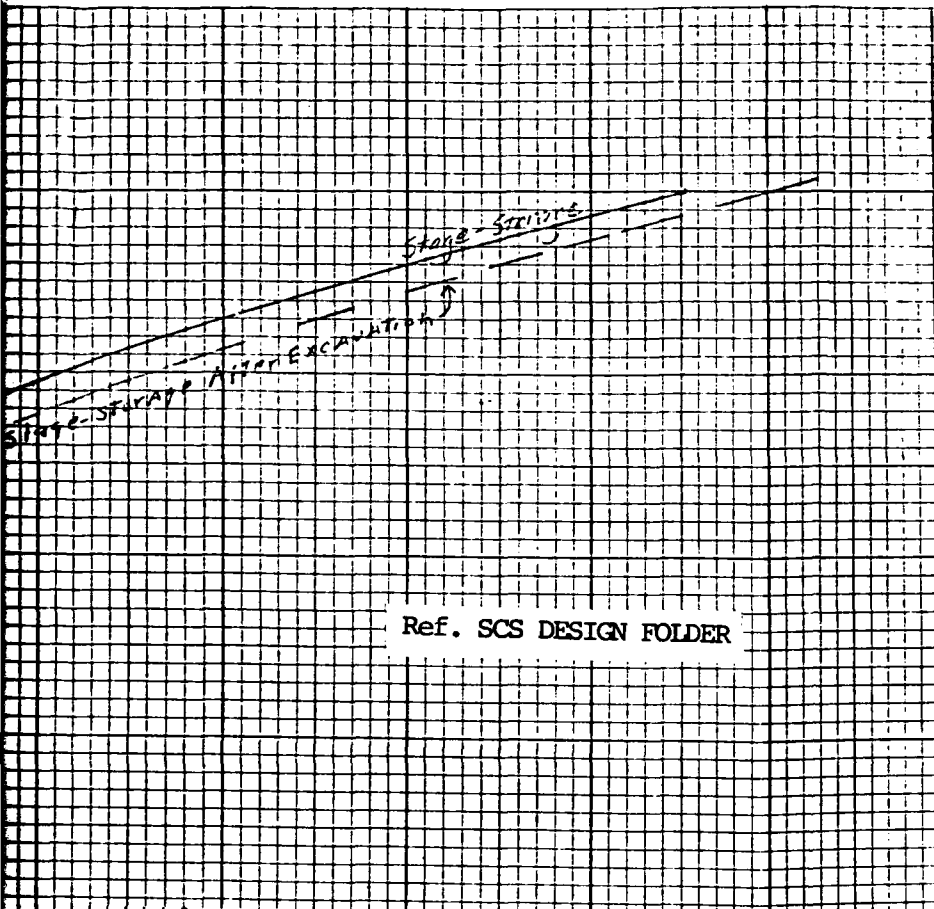
Emergency spillway flow is added to flow through principal spillway and is shown on sheet 9.

Dam crest profile - a survey of the dam crest disclosed a low spot, about elevation 581.7 ft, near the left abutment. The crest profile is entered in the computer program, see sheet 9.

Spillway Adequacy - as the spillway will pass the PMF without overtopping, the spillway is rated as "Adequate".







Ref. SCS DESIGN FOLDER

KAERCHER CREEK W.S.  
SCS PA. 476

SHEET 5 OF 11

2

Penna.

Kearner Creek D.C.

JMR

11-27-63

Pg. 475

8

Discharge Formulae

Orifice: Max. Q allowed = 20 cfs (± 3 cfs); Max. Head = 26'

Try: 1' x 1 1/2'

$$Q = CA \sqrt{2gh}$$

$$\frac{L}{P} = \frac{1}{5} = 0.20 \quad C = 0.74$$

Reference for C: Kings Handbook, Table 22  
 "Coefficients of Discharge C for Submerged Tubes"  
 page 3-40

$$Q = 0.74(1.5)(8.03) 2.79 = 24.9 \text{ cfs}$$

Use → Try: 1' x 1 1/4'

$$\frac{L}{P} = \frac{1}{4.5} = 0.22, \quad C = 0.75$$

$$Q = 0.75(1.25)(8.03) 2.79 = 21 \text{ cfs}$$

$$Q = 7.52 h^{3/2}$$

Pipe: Max. Head = 26'; Length of Pipe = 600'Try: 24" concrete;  $n = 0.015$ 

$$Q = K L \sqrt{2gh}$$

$$K = \frac{1}{\sqrt{1 - K_r + K_p L}} = \frac{1}{\sqrt{1 - 1.5 - \frac{0.0165(200)}{3.3}}}$$

$$K = \frac{1}{15.8} = 0.415$$

$$Q = 10.45 h^{3/2}$$

$$Q = 0.415(3.14)(8.03) 5.1 = 53.3 \text{ cfs.}$$

Weir:  $Q = CL h^{3/2}$   $L = 3 \times 2 \times 2 = 12'$ 

$$Q = 3.4(12) h^{3/2}$$

$$Q = 40.8 h^{3/2} \checkmark$$

Ref. SCS DESIGN FOLDER

JMR  
 27 Nov 63

1\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAN SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
 \*\*\*\*\*

RUN DATE\* 79/12/04.  
 TIME\* 07.31.46.

OVERTOPPING ANALYSIS  
 SCS PA 476  
 NDI PA 00719 DER NO. 6-456

JOB SPECIFICATION									
NQ	NHR	NNIN	IDAY	INR	ININ	NETRC	IPLI	IPRT	NSTAN
200	0	30	0	0	0	0	0	-4	0
			JOPER	NUT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED  
 NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

## SUB-AREA RUNOFF COMPUTATION

## INFLOW HYDROGRAPH

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

## HYDROGRAPH DATA

INYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.50	0.00	.50	1.00	0.000	0	1	0

## PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.00	113.00	123.00	132.00	142.00	0.00	0.00

## LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSHX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

## UNIT HYDROGRAPH DATA

TP = 1.25 CP = .40 NTA = 0

## RECESSION DATA

STRTO = -1.50 ORCSN = -.05 RTIOR = 2.00

UNIT HYDROGRAPH 28 END-OF-PERIOD ORDINATES, LAG = 1.25 HOURS, CP = .40 VOL = 1.00									
25.	77.	97.	82.	67.	55.	45.	36.	30.	24.
20.	16.	13.	11.	9.	7.	6.	5.	4.	3.
3.	2.	2.	1.	1.	1.	1.	1.	1.	1.

## END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
-------	-------	--------	------	------	------	--------	-------	-------	--------	------	------	------	--------

SUM 32.66 30.22 2.44 20220.  
( 830. ) ( 768. ) ( 62. ) ( 572.57 )

# HYDROGRAPH ROUTING

## OUTFLOW HYDROGRAPH

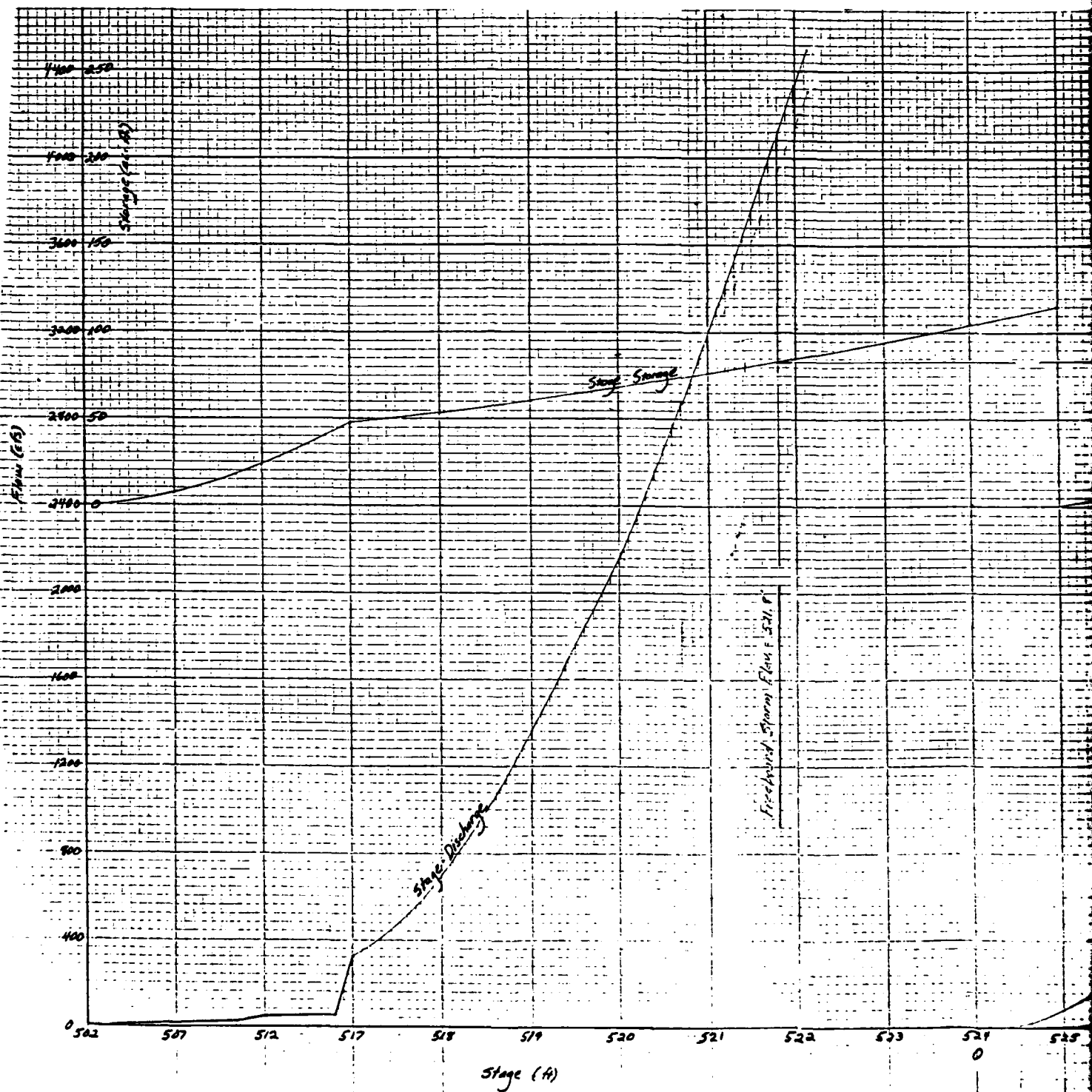
ISTAQ	ICONP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR	
0.0	0.000	0.00	1	1	0	0	0	
NSIPS NSIDL								
1	0	LAG	ANSKK	X	TSK	STORA	ISPRAT	
		0	0.000	0.000	0.000	-501.	-1	
STAGE	501.00	504.00	510.40	512.40	516.00	518.00	520.00	522.00
FLOW	0.00	12.00	22.00	49.00	53.00	699.00	2151.00	4198.00
CAPACITY=	6.	15.	32.	59.	72.	86.	112.	
ELEVATION=	501.	505.	510.	516.	518.	520.	523.	
CREL SPWID CUBW EXPW ELEVL COQL CAREA EXPL								
	501.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

## DAM DATA

TOPEL	COOD	EXPD	DAMWID
521.7	0.0	0.0	0.

CREST LENGTH 0. 33. 400.  
 AT OR BELOW  
 ELEVATION 521.7 522.0 522.7  
 PEAK OUTFLOW IS 1531. AT TIME 41.00 HOURS







1000 CFS

STORAGE

INFLOW HYDROGRAPH

OUTFLOW HYDROGRAPH

Time (Hr)

HYDROLOGIC DATA

CLASS STRUCTURE	"C"
DRAINAGE AREA	1.50 SQ. MI.
RAINFALL	28.11 INCHES
RUNOFF	20.63 INCHES
T <sub>C</sub>	0.81 HOURS
CURVE NO.	76
MOISTURE CONDITION	II

$$T = 5000 \text{ ft} \times \frac{500}{400 \text{ ft}^2} = 6.25 \text{ hr} \times \frac{1 \text{ hr}}{60 \text{ min}} = 0.104 \text{ hr}$$

$$\text{One sq. mi.} = 640 \text{ ac} \times 1960 \text{ sec} = 1254400 \text{ ac-sec} = 16.35 \text{ ac-sec}$$

Check:  $5.12 \text{ sq. mi.} = 327.68 \text{ ac}$   
 $327.68 \text{ ac} \times 1960 \text{ sec} = 642252.8 \text{ ac-sec}$   
 $0.3 \text{ TIME} = 1\% \text{ error}$

Freeboard Storm Elev. 501.9'  
 Obs. Depth Storm at 23" = 521.0' + 20.75' = 541.75'

REF:-  
 SCS DESIGN  
 FOLDER

Freeboard Storm Routing  
 Keescher Creek N.S., P. 476

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

Designed	Date	Approved by
Drawn		Title
Traced		Title

**APPENDIX**

**E**



**SECTION I - SILTY SAND (SM) MATERIAL REPRESENTED BY TP#204 FROM 1.0' TO 4.0', AND SILT (ML) MATERIAL REPRESENTED BY TP#201 FROM 1.0' TO 5.0'**

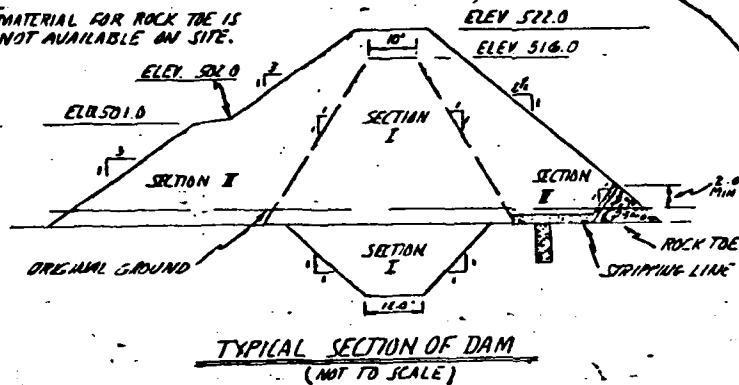
**SECTION II - SILTY CLAYEY GRAVEL (GC-GM) MATERIAL REPRESENTED BY TP#207 FROM 0.5' TO 3.0' AND WEATHERED ROCK REPRESENTED BY TP#205 FROM 4.0' TO 9.0'**

**NOTE: LOSS OF TP#201, TP#205, TP#207, TP#208 LOCATED ON SHEET 2.**

**DENSITY OF COMPACTED FILL WILL BE DETERMINED BY ASTM D-698, METHOD C WITH CORRECTION FOR MATERIAL LARGER THAN 40"**

**COMPACT ALL FILL AS CLASS B-2 (EXCEPT ROCK TOE) 95% STANDARD PROCTOR, USING A 450 PSI TAMPING ROLLER, MIN. DRUM DIA. 20" EXCEPT STRUCTURAL BACKFILL.**

**NOTE: MATERIAL FOR ROCK TOE IS NOT AVAILABLE ON SITE.**



**DATE OF GEOLOGIC INVESTIGATION: NOV. '63  
UNIFIED SOIL CLASSIFICATION BY VISUAL INSPECTION**

**TP#101 EL. 528.3**

TP#101  
SILTY SANDSTONE,  
SILT IN SPACES  
REFUSE

**TP#102 EL. 519.1**

TP#102  
SAND, SILTY, MEDIUM, COMPACT  
SANDSTONE & SILTSTONE  
(BROWN), SILT & CLAY  
IN SPACES, HARD  
REFUSE

**TP#103 EL. 498.3**

TP#103  
SILT, SANDY, FINE GRAINED,  
MEDIUM, FIRM  
UNWEATHERED SILTSTONE &  
SAND, BROWN, CRACKLED  
ON SURFACE SILT WEATHERED;  
VERY COMPACT & MOIST  
SAND & SILTSTONE (CRACKLED,  
BROWN), SILTY SAND  
MEDIUM, FIRM  
REFUSE

**TP#104 EL. 509.0**

TP#104  
SAND, SILTY & SANDY  
COMPACT, MEDIUM  
SANDSTONE & SILTSTONE,  
SILT & CLAY IN SPACES  
REFUSE

**TP#105 EL. 520.5**

TP#105  
SILT, SANDY,  
MEDIUM, FIRM  
SAND, SILTY  
VERY COMPACT  
SANDSTONE & SILTSTONE, CRACKLED, BROWN, SILT & CLAY  
IN SPACES, MEDIUM, FIRM  
REFUSE

**TP#115 EL. 510.5**

TP#115  
SILT, SANDY, MEDIUM;  
MEDIUM  
SAND, SILTY & SANDY  
(COMPACT), WEATHERED, BROWN,  
MEDIUM, COMPACT  
SANDSTONE & SILTSTONE,  
CRACKLED, BROWN, SILT & CLAY  
IN SPACES, MEDIUM  
REFUSE

**TP#116 EL. 512.2**

TP#116  
SAND, SILTY, MEDIUM, MEDIUM  
SAND, SILTY, COMPACT, MEDIUM  
SANDSTONE (WEATHERED,  
BROWN), SAND & SILT SAND;  
MEDIUM, HARD  
REFUSE

**TP#117 EL. 512.2**

TP#117  
SAND, SILTY, MEDIUM;  
MEDIUM, FIRM  
SANDSTONE & SILTSTONE  
(CRACKLED, BROWN), SILT & CLAY  
IN SPACES, MEDIUM, FIRM  
REFUSE

**TP#118 EL. 520.1**

TP#118  
SAND, SILTY, MEDIUM;  
MEDIUM, COMPACT  
WEATHERED SANDSTONE,  
SILT IN SPACES,  
MEDIUM  
SANDSTONE & SILTSTONE,  
CRACKLED, BROWN, SILT & CLAY  
IN SPACES,  
REFUSE

**TP#119 EL. 519.0**

TP#119  
SAND, SILTY, MEDIUM, MEDIUM  
SAND, SILTY, MEDIUM, MEDIUM  
SANDSTONE, WEATHERED,  
BROWN, (MEDIUM IN SPACES)  
REFUSE

# LEGEND



AREA TO BE CLEARED AND SCRUBBED - 33 ACRES

BORROW & SPILL DISPOSAL AREA LIMIT

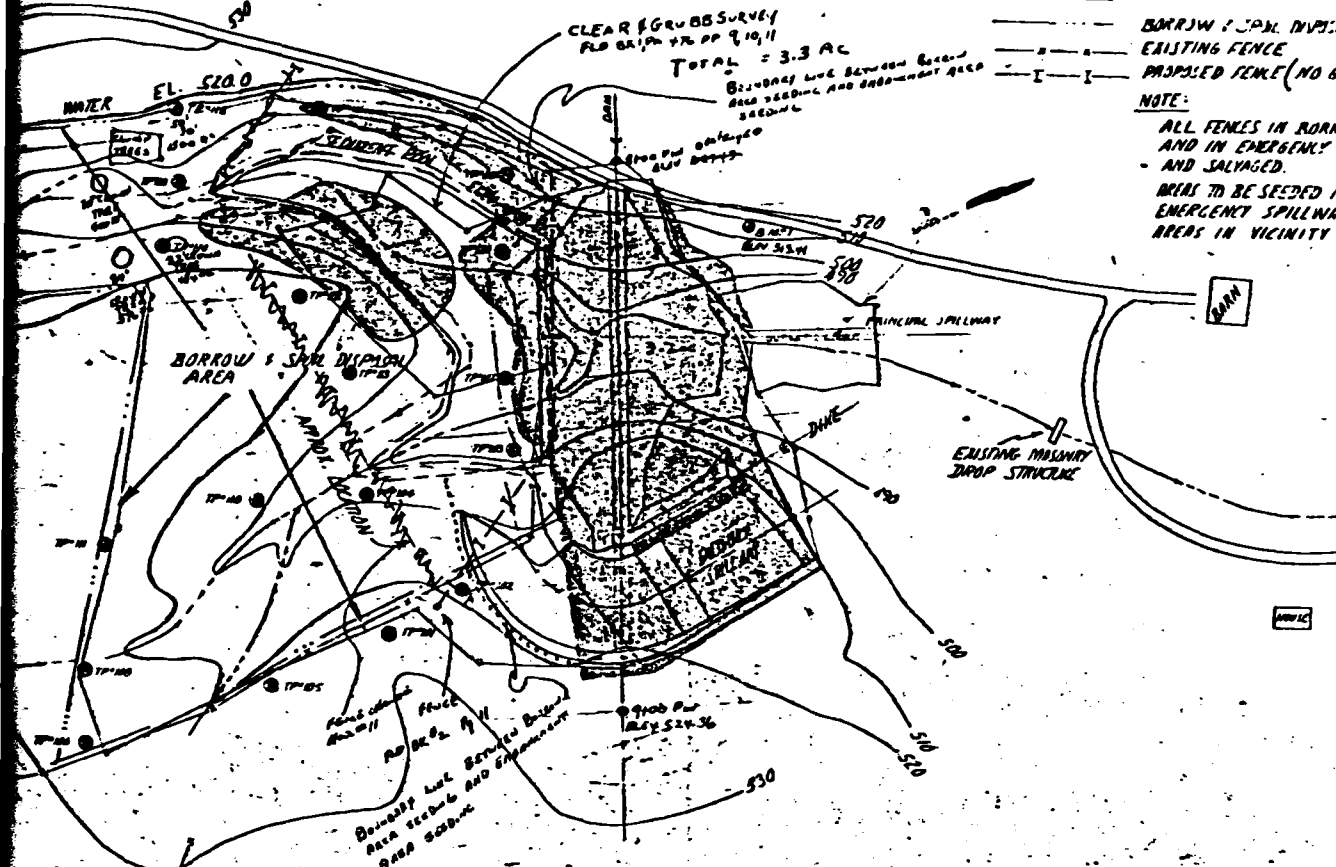
EXISTING FENCE

PROPOSED FENCE (NO GATES REQUIRED)

## NOTE:

ALL FENCES IN BORROW AREA UNDER DAM AND IN EMERGENCY SPILLWAY TO BE REMOVED AND SALVAGED.

AREAS TO BE SEEDING INCLUDE ONLY DAM, DUNE, EMERGENCY SPILLWAY AND DISTURBED AREAS IN VICINITY OF DAM.



TP 107 EL. 496.5

AS	CL	TOPSOIL
AS	CL	CLAY SANDY W/ SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 108 EL. 528.0

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 109 EL. 528.6

AS	CL	TOPSOIL
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 110

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT, SLIGHTLY MOIST
AS	CL	SAND, SILTY, COMPACT, MOIST
AS	CL	CLAY, SILTY SAND, MOIST
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 106 EL. 524.1

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	SAND, SILTY SAND, MOIST, COMPACT
AS	CL	WETTERED SANDSTONE, CLAY IN SEAMS, WATER ENTICING AT BOTTOM
AS	CL	REFUSE

TP 111 EL. 526.0

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	WETTERED SANDSTONE, CLAY IN SEAMS, MOIST
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 112 EL. 522.6

AS	CL	TOPSOIL
AS	CL	WETTERED SANDSTONE (BROWN), CLAY IN SEAMS, MOIST
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 113 EL. 513.8

AS	CL	TOPSOIL
AS	CL	SAND, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), CLAY IN SEAMS, MOIST
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 114 EL. 510

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 105 EL. 520.5

AS	CL	TOPSOIL
AS	CL	SAND, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 119 EL. 519.0

AS	CL	TOPSOIL
AS	CL	SAND, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 120 EL. 507.1

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	SAND, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

TP 121 EL. 495.3

AS	CL	TOPSOIL
AS	CL	CLAY, SILTY SAND, MOIST, COMPACT
AS	CL	SANDSTONE (WEATHERED), MOIST, COMPACT
AS	CL	SANDSTONE (BROWN), CLAY IN SEAMS
AS	CL	REFUSE

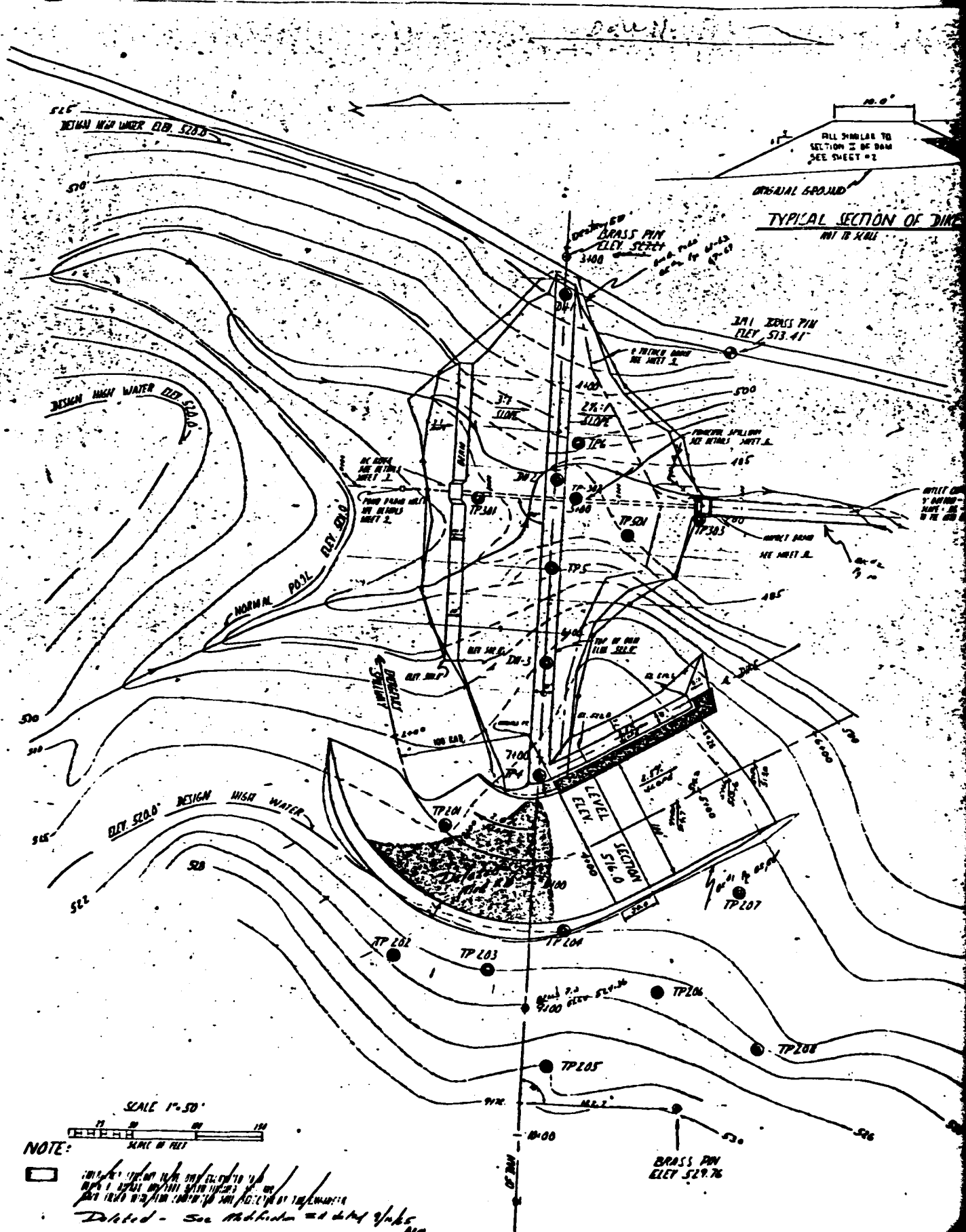
AS BUILT PLANS

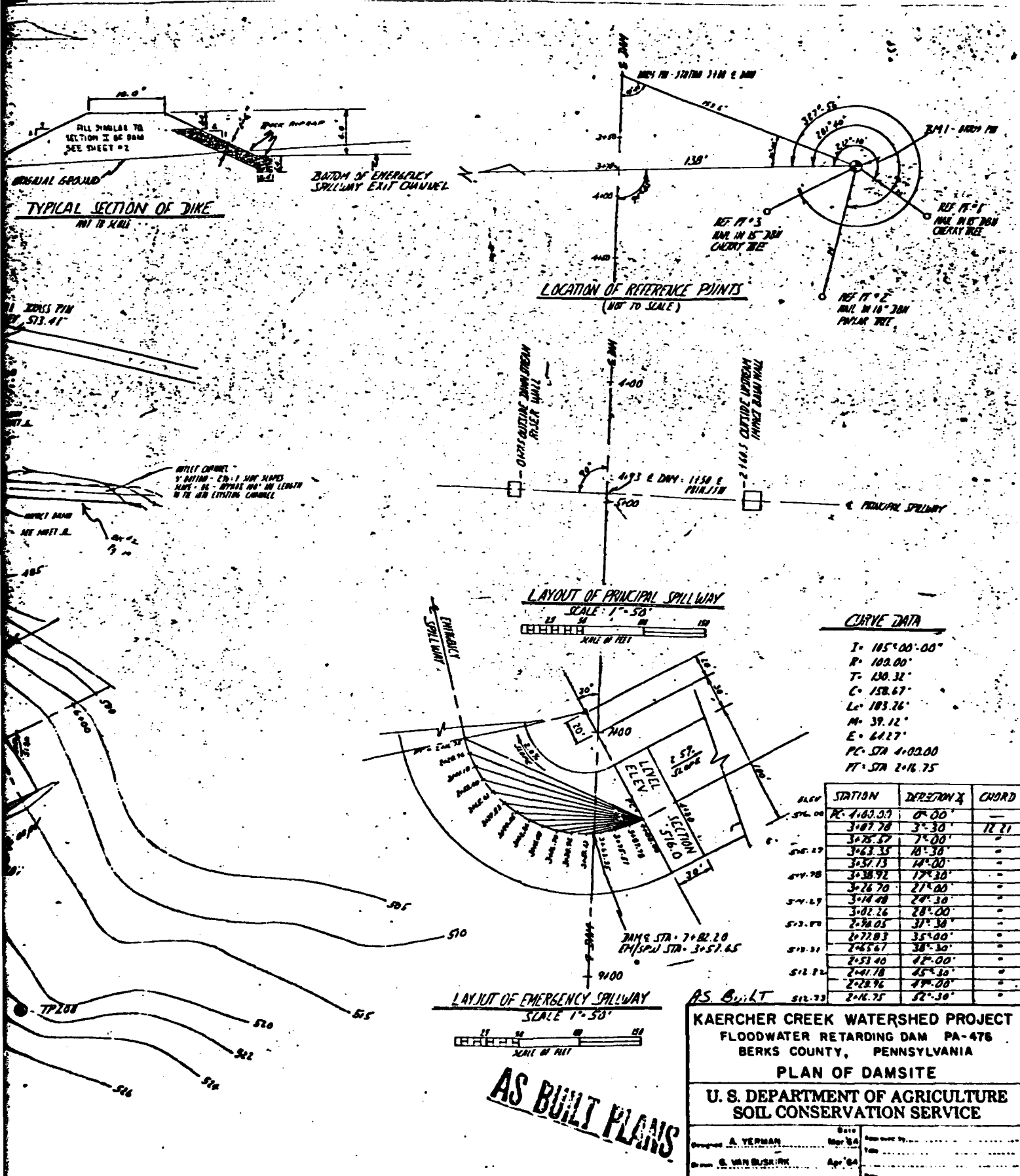
Scale in Feet

AS BUILT. Scale 1"=100'

KAERCHER CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA  
PLAN OF STORAGE AREA  
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Drawn by: A. YERMAN  
Checked by: R. MAYS  
Date: May '64  
Scale: 1"=100'





**KAERCHER CREEK WATERSHED PROJECT**  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA

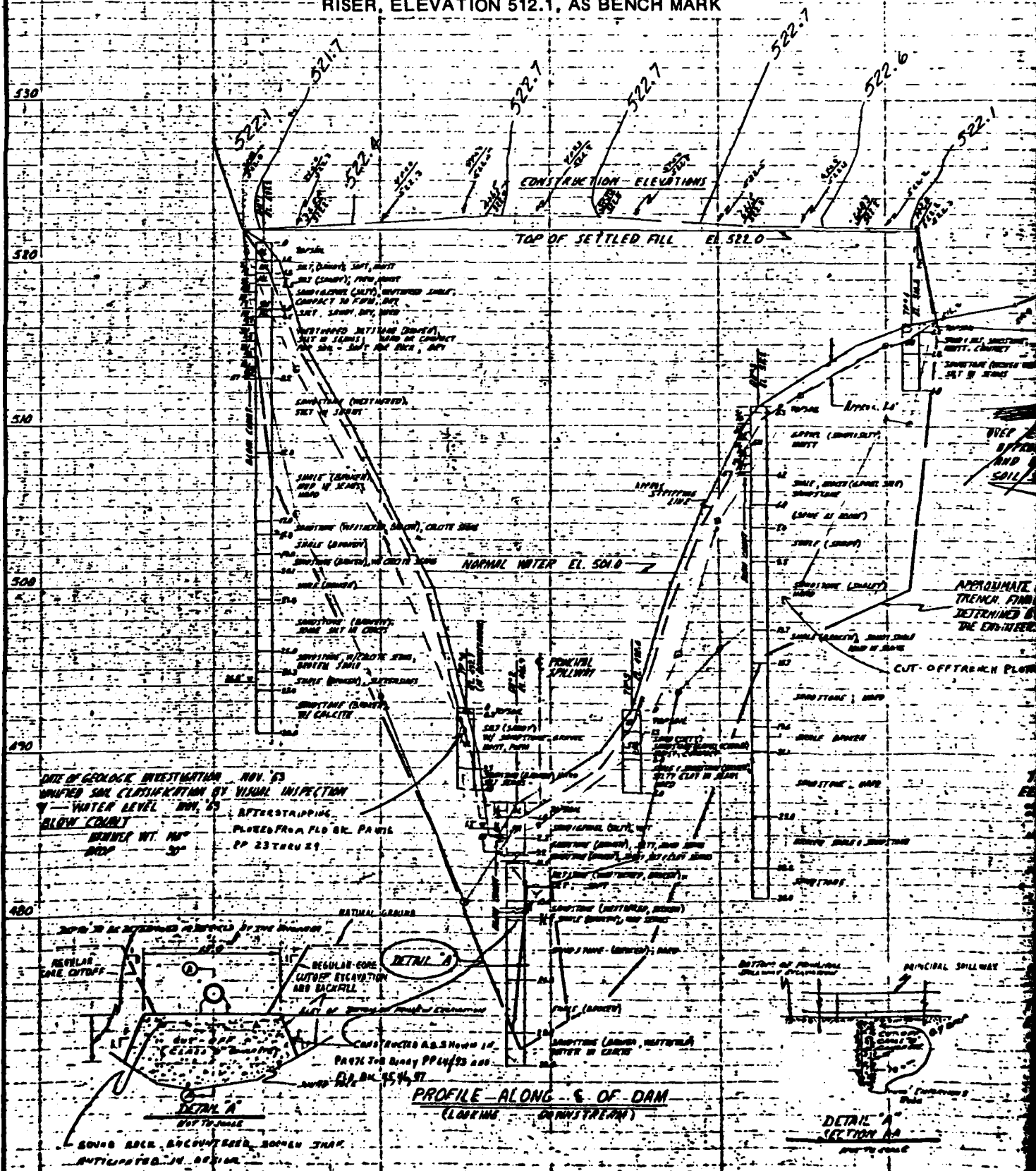
**PLAN OF DAMSITE**

**U. S. DEPARTMENT OF AGRICULTURE**  
**SOIL CONSERVATION SERVICE**

Designed by <b>A. YERMAN</b>	Check by <b>...</b>
Drawn by <b>G. VAN BUREN</b>	Check by <b>...</b>
Traced by <b>...</b>	Check by <b>...</b>

Scale: 1" = 50'

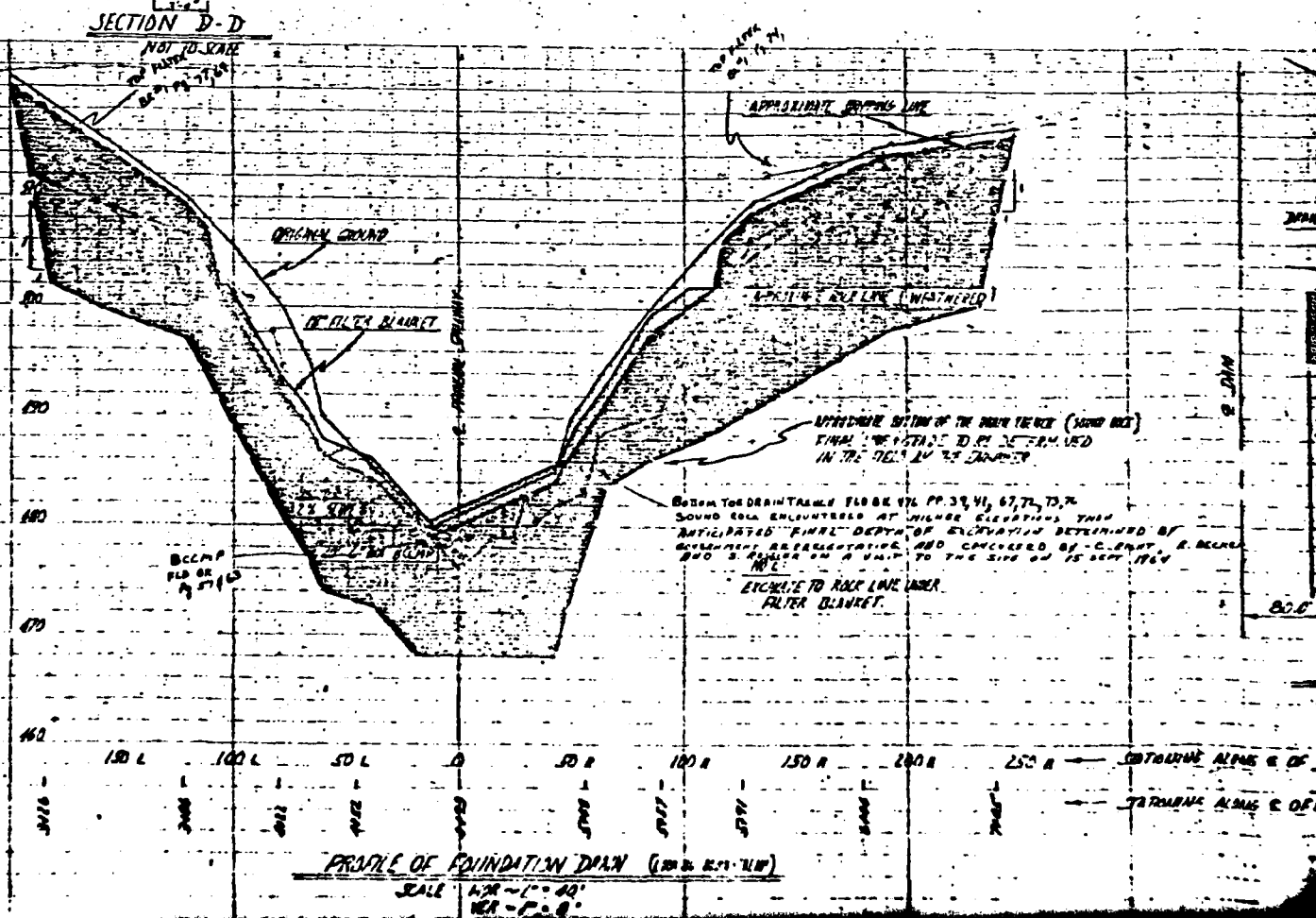
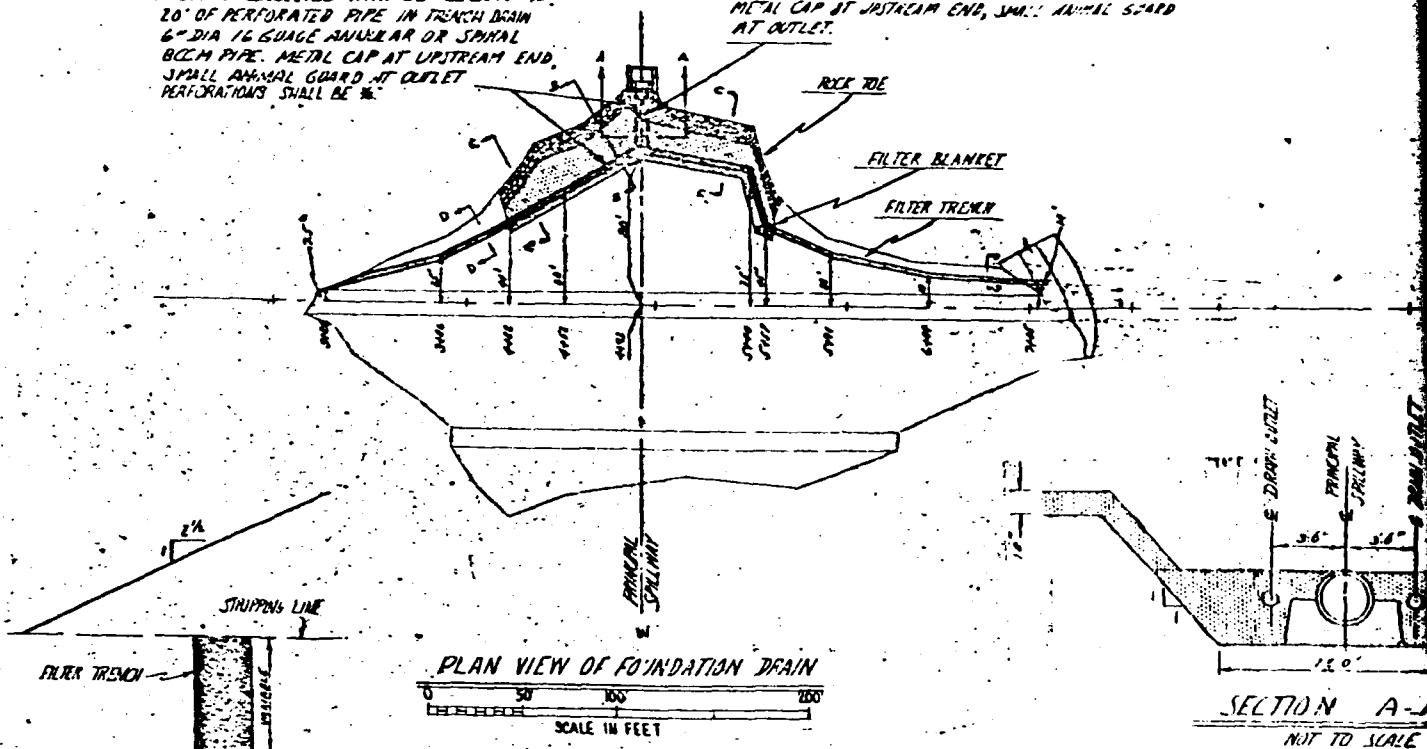
ELEVATIONS MEASURED 10/26/79 USING TOP OF  
RISER, ELEVATION 512.1, AS BENCH MARK



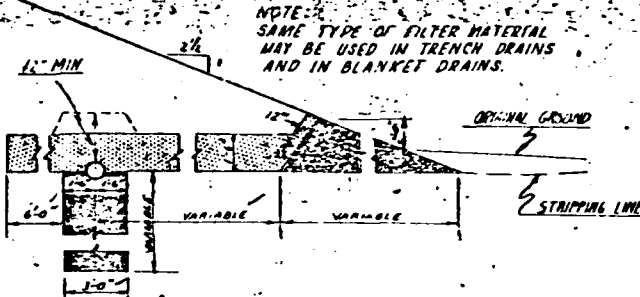
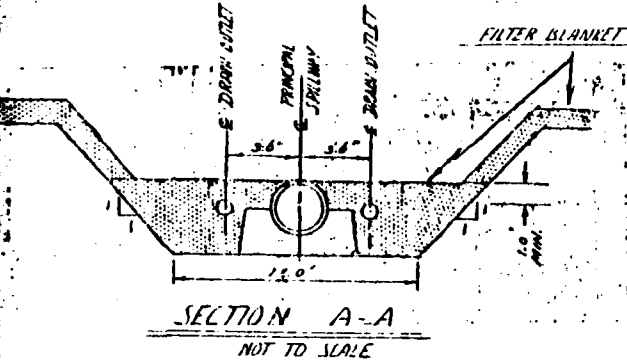
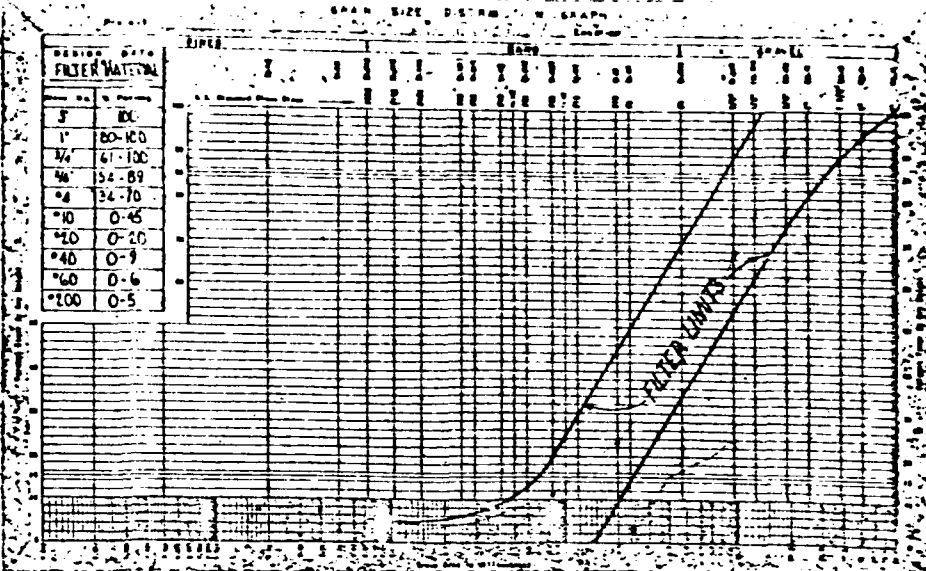




36" OF PERFORATED PIPE - 6" DIA 16 GAGE ANVILAR  
OR SPIRAL BEAM PIPE WITH STANDARD CURVE BEYONDS.  
METAL CAP AT DOWNSTREAM END, SMALL ANIMAL SCARD  
AT OUTLET.

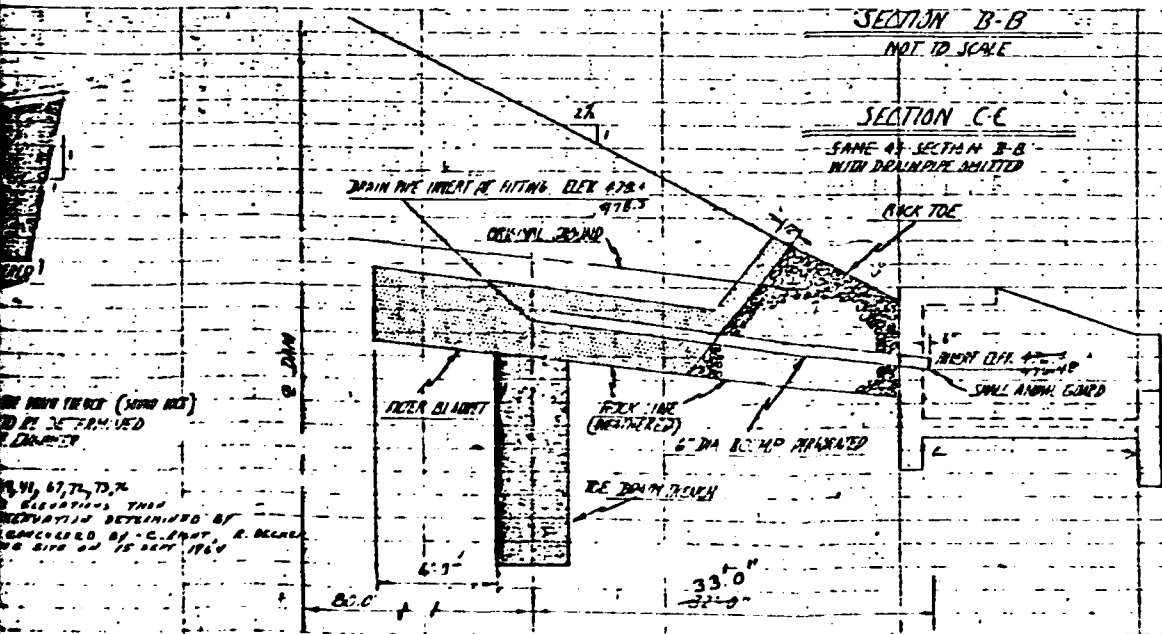


IN CASE ANVILAR  
COPPER SANDS  
ANVIL SCARD



SECTION B-B  
NOT TO SCALE

SECTION C-C  
SAME AS SECTION B-B  
WITH DRAINPIPE OMITTED



PROFILE OF FOUNDATION DRAIN OUTLET (LEFT OF PRINCIPAL SPILLWAY)  
NOT TO SCALE

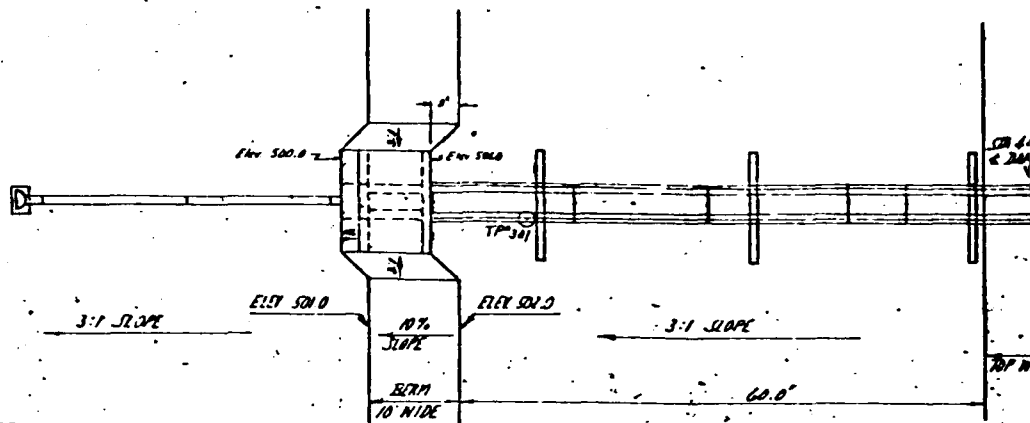
NOTE  
FOUNDATION DRAIN OUTLET RIGHT OF PRINCIPAL  
SPILLWAY IS SIMILAR EXCEPT 6" DIA DRAINPIPE  
IS EXTENDED 6 FEET TO UPSTREAM EDGE OF  
FILTER BLANKET AND CAPPED

AS BUILT PLANS

AS BUILT

KAERCHER CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA  
FOUNDATION DRAIN DETAILS  
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed by	A. YERMAN	Drawn by	M. C. '64
Checked by	G. VAN BUSKIRK	Reviewed by	M. C. '64
Date		Date	
Scale		Scale	

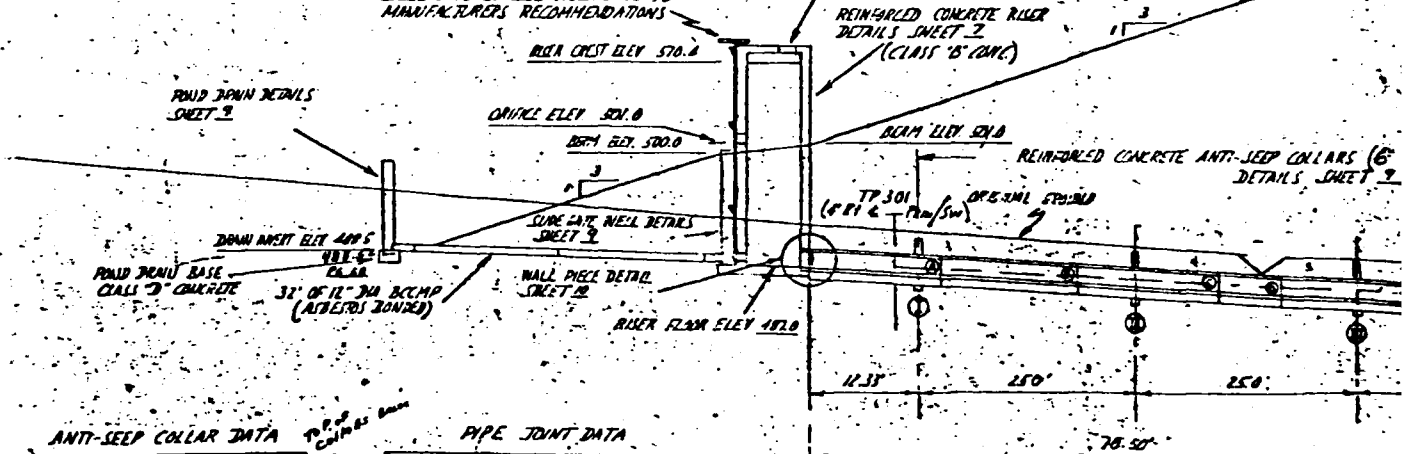


#### SLIDE GATE NOTES:

1. SLIDE GATE - 12" DIA FLANGE BACK ARMCO MODEL 35-05C OR EQUAL.
2. ARMCO 12" LONG WALL THIMBLE, ROUND OPENING, ROUND FLANGE OR EQUAL.
3. RISING STEM - THREADED PORTLAND BRONZE.
4. FULLY ADJUSTABLE STEM GUIDES.
5. STEM, STEM GUIDES AND LIFTING DEVICE SIZED AND SPACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

MANUFACTURE COVER  
NEEDHAM FOUNDRY  
COMPANY CATALOG  
"R" R-6550-KH 24" x 24"  
WITH TYPE "A" HASP  
OR EQUAL

#### PLAN OF PRINCIPAL



#### ANTI-SEEP COLLAR DATA

COLLAR	DISTANCE FROM RISER WALL	INVERT ELEVATION OF 12" DIA WATER PIPE	TP 301 CHAINING DATA
I	12.33'	486.28	485.59
II	37.33'	484.70	484.01
III	62.33'	483.29	482.59
IV	87.33'	482.75	482.05
V	112.33'	480.71	480.01
VI	129.33'	479.27	478.57

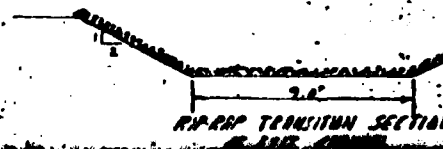
#### PIPE JOINT DATA

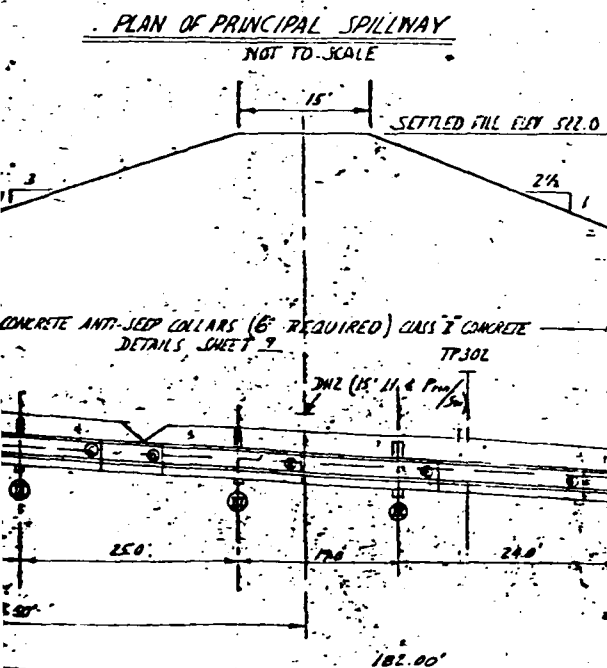
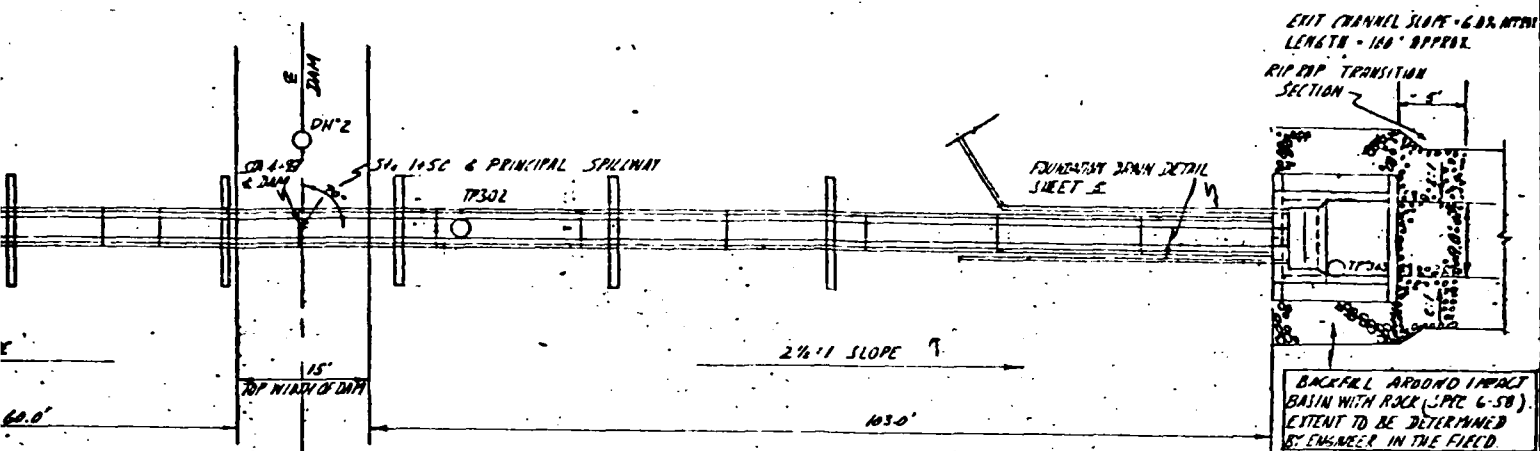
POINT	DISTANCE FROM RISER WALL	INVERT ELEVATION OF 12" DIA WATER PIPE	SLOPE
RISER	0	487.00	487.01
A	16	486.04	486.04
B	32	485.08	485.10
C	48	484.13	484.11
D	64	483.27	483.19
E	80	482.81	482.72
F	96	481.85	481.71
G	112	480.89	480.71
H	128	479.93	479.74
I	144	478.97	478.77
J	160	478.02	477.83
K	176	477.06	477.88
L	192	476.10	476.90

NOTE:  
DIMENSIONS OF PIPE ARE BASED ON NOMINAL SIZE AND DO NOT INCLUDE CREEP.

#### PROFILE

TP 301  
ELEV 472.6  
SEE SHEET 3





#### 24" ID REINFORCED CONCRETE WATER PIPE

- 11 - 16' SECTIONS
  - 1 - 6' SECTION
  - 1 - WALL PIECE FOR 12" WALL
- SUBSTITUTION OF ALTERNATE PIPE LENGTH SECTIONS MUST HAVE PRIOR APPROVAL

TOTAL - 183.33'

PRESSURE HEAD - 45'

LOAD - 31800 LBS. PER LIN. FT. BASED ON O.D. OF 31"

MIN. 3 EDGE BEARING STRENGTH FOR

0.01" CRACK THIN-PRESTRESSED PIPE = 9571 LBS. PER LIN. FT.

0.001" CRACK PRESTRESSED PIPE = 7176 LBS. PER LIN. FT.

APPROXIMATE SHED LINE

CRADLE CLASS B CONCRETE

PIPE INVERT ELEV. 476.1

EAST OUTSIDE OF SPIGOT JOINT RING WITH CONCRETE ON ONE R' SECTION OF PIPE FOR OUTLET

TP303

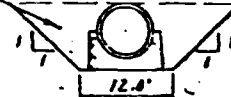
BOTTOM OF OUTLET

PIPE INVERT ELEV. 476.1

IMPACT BASIN DETAILS SHEET 2

COMPACTED FILL CLASS B-2 BACKFILL WITH SELECTED MATERIAL AS DIRECTED BY THE ENGINEER.

APPROX. AROUND LINE



TYPICAL SECTION  
PRINCIPAL SPILLWAY EXCAVATION

AS BUILT NOT TO SCALE

11 SHEET 4 FOR LOG OF DML

TP302  
ELEV 486.9

NO.	DESCRIPTION	DATE
1	AS BUILT	NOV 63
2	REVISION	
3	REVISION	
4	REVISION	
5	REVISION	
6	REVISION	
7	REVISION	
8	REVISION	
9	REVISION	
10	REVISION	

TP303  
ELEV 480.4

NO.	DESCRIPTION	DATE
1	AS BUILT	NOV 63
2	REVISION	
3	REVISION	
4	REVISION	
5	REVISION	
6	REVISION	
7	REVISION	
8	REVISION	
9	REVISION	
10	REVISION	

## AS BUILT PLANS

DATE OF GEOTECHNICAL INVESTIGATION: NOV 63

UNITED JOB CLASSIFICATION BY VISUAL INSPECTION

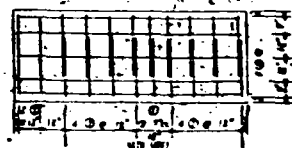
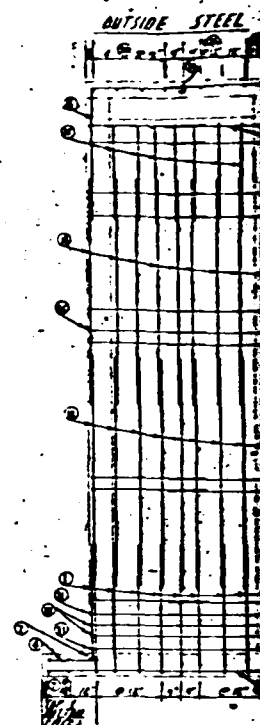
WATER LEVEL AT GEO. TECH. INVESTIGATION DATE

KAERCHER CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA

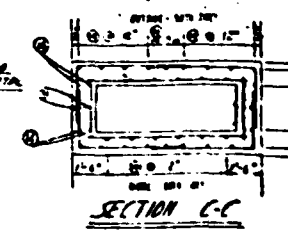
PLAN-PROFILE OF PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed	A. YERMAN	Mar '64
Drawn	G. E. VAN BUSCK	Mar '64
Checked		
Approved		



BOTTOM FACE



SECTION ALONG CENTERLINE

FEAR WALL

**INSIDE STEEL**

INSIDE STEEL

OUTSIDE STEEL

ORIFICE

**EL. 512.1**

EL 510.4

**SHEET 2**

—

•

DR. J. H. HARRIS

01.0

•

**089-01**

490.0 IS R

CHANGED 11

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REQUIRED)

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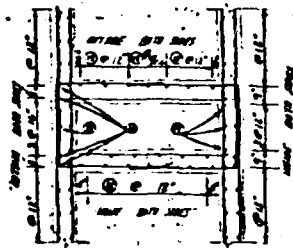
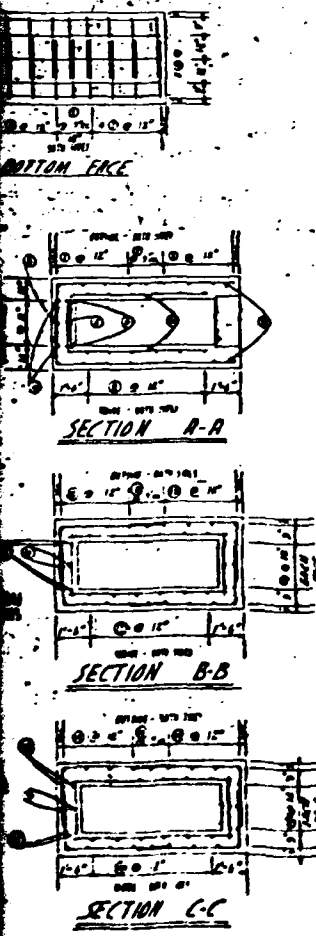
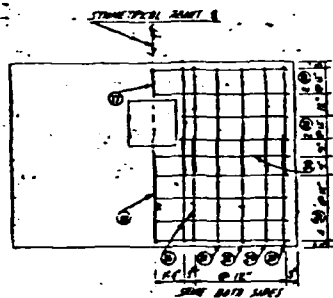
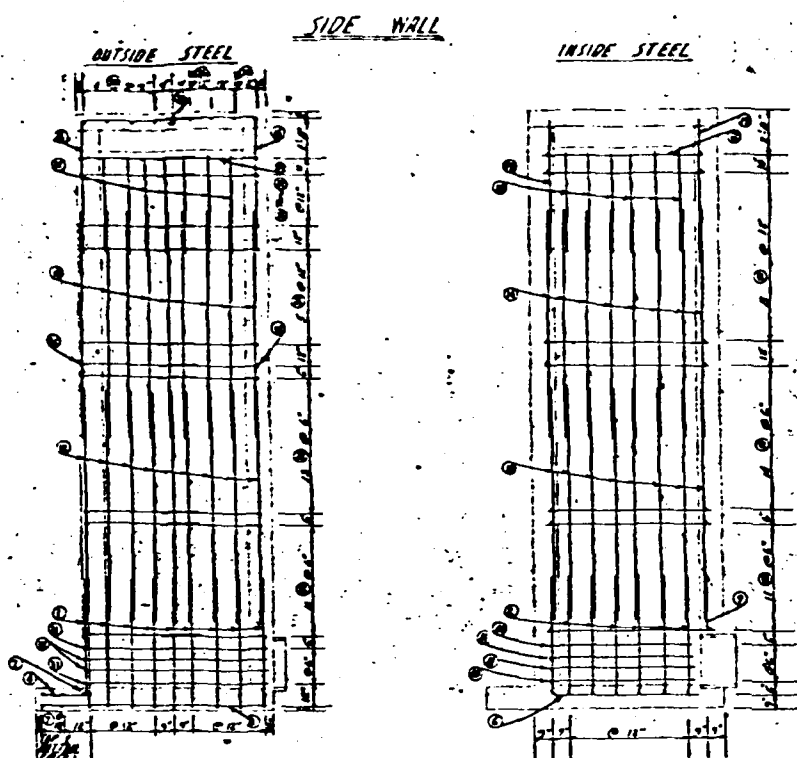
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11-11-88

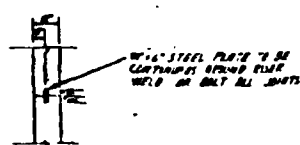
SECTION

SECTION

**SECTION**



SECTION BETWEEN ELEV 505.9 & 510.4



CONSTRUCTION JOINT DETAIL FOR ALL RISER JOINTS

STEEL SCHEDULE									
NO.	DESCRIPTION	QTY	SIZE	TYPE	A	B	WGT. FT.	WGT. LB.	WGT. KG.
1	OUTSIDE BAR	12	7/8"	2	15'	15'	148.56	148.56	67.34
2	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
3	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
4	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
5	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
6	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
7	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
8	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
9	WATER	12	7/8"	2	15'	15'	148.56	148.56	67.34
10	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
11	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
12	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
13	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
14	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
15	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
16	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
17	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
18	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
19	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
20	WATER	12	7/8"	2	15'	15'	148.56	148.56	67.34
21	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
22	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
23	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
24	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
25	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
26	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
27	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
28	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
29	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
30	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
31	WATER	12	7/8"	2	15'	15'	148.56	148.56	67.34
32	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
33	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
34	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
35	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
36	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
37	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
38	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
39	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
40	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
41	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
42	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
43	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
44	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
45	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
46	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
47	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
48	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
49	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
50	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
51	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
52	WATER	12	7/8"	2	15'	15'	148.56	148.56	67.34
53	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
54	"	12	7/8"	2	15'	15'	148.56	148.56	67.34
55	"	12	7/8"	2	15'	15'	148.56	148.56	67.34

BAR TYPES

STEEL QUANTITIES

NO. 4 BARS	2695.97 FT.	1779.97 LBS.
NO. 5 BARS	3469.56 FT.	3413.56 LBS.
NO. 6 BARS	134.33 FT.	201.76 LBS.

CONCRETE QUANTITIES

CLASS B 20 CU YDS.  
CLASS D 25 CU YDS. (OUTSIDE WALL & FLOOD DRAIN INLET)  
FOR OTHER STEEL & CONCRETE QUANTITIES SEE SHEET D.

SEE SHEET 10 FOR GENERAL NOTES

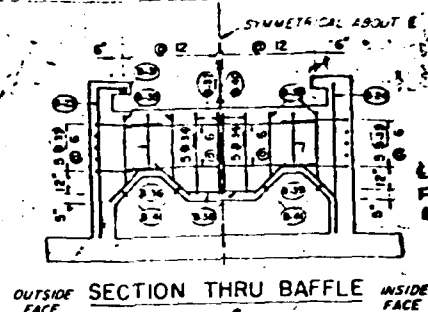
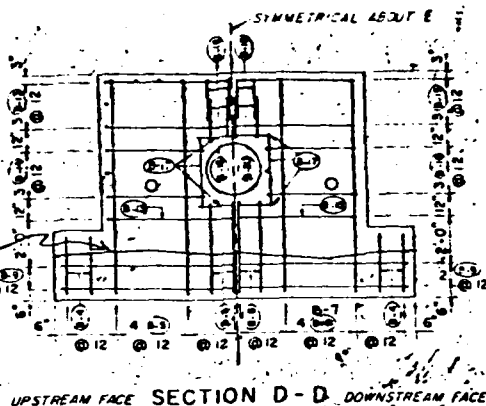
AS BUILT PLANS

AS BUILT

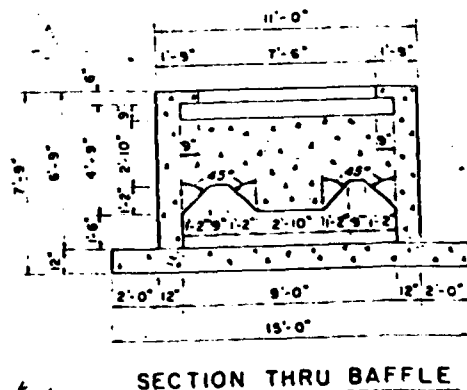
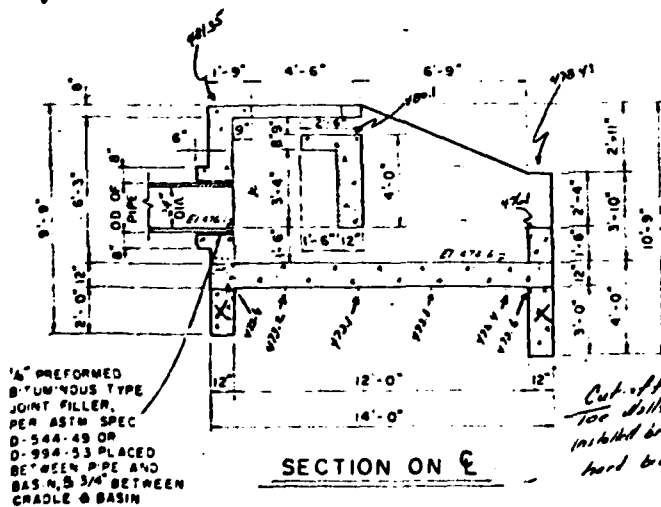
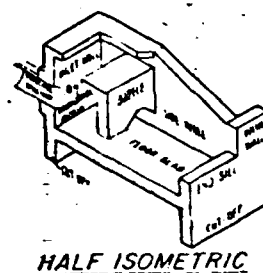
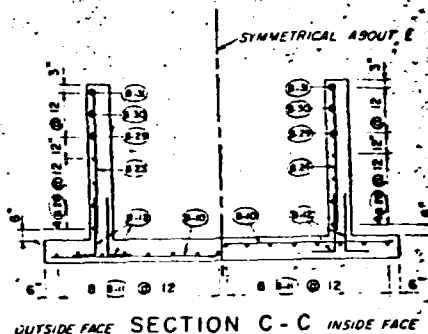
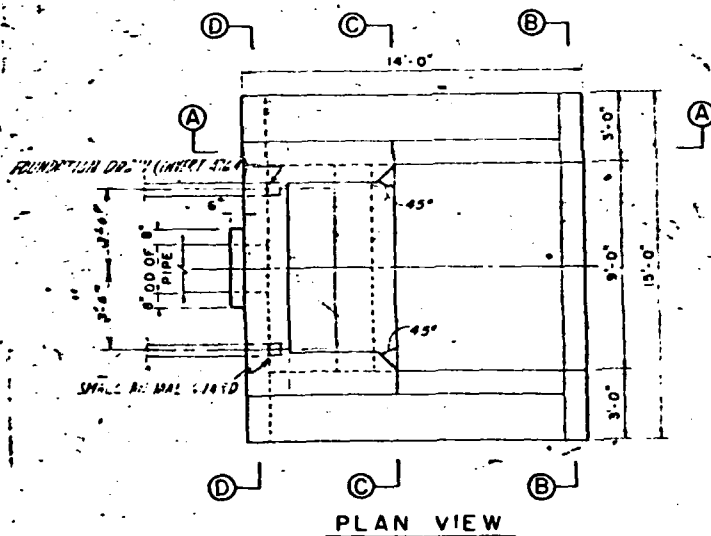
KAERCHER CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA  
STRUCTURAL DETAILS  
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

DATE: A YERMAN May '63  
DRAWN: CCRISE BR WAYS May '64  
CHECKED: A YERMAN April '64  
PA-476-P

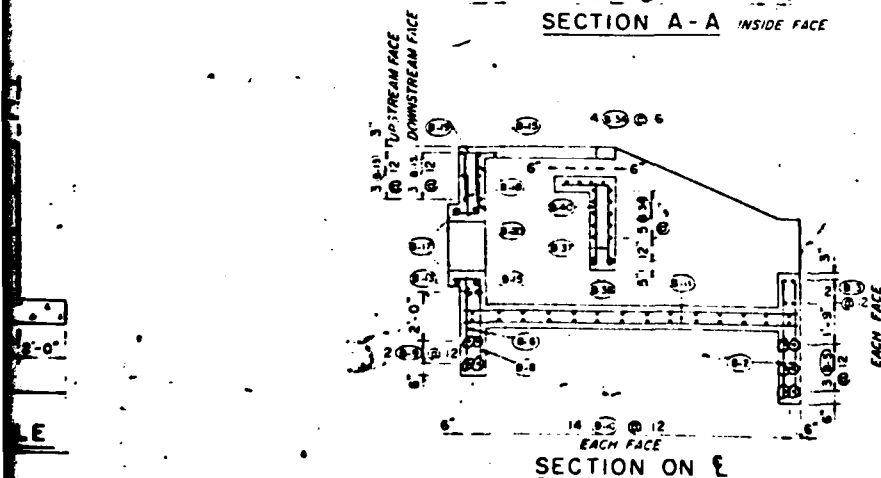
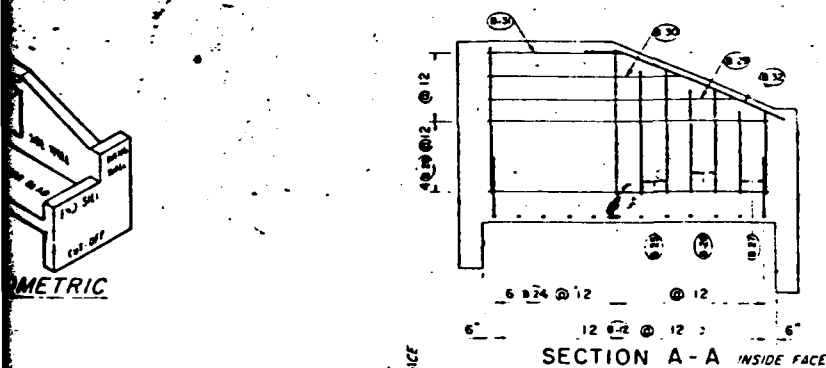
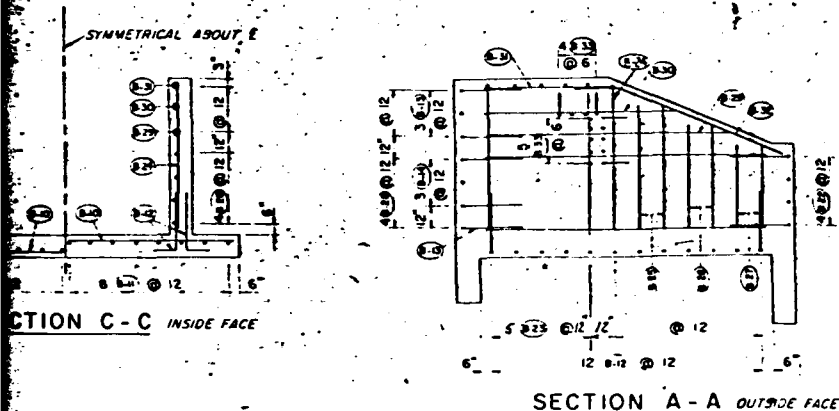
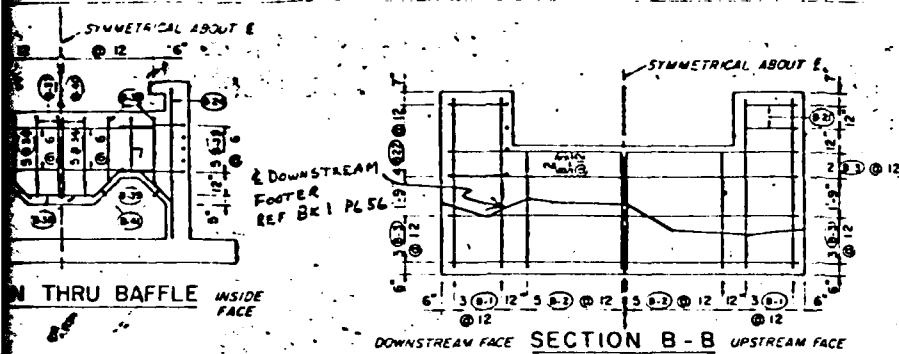
UPSTREAM FOOTER  
REF BK 1 PG 56



NOTE:  
END SECTIONS OF FOUNDATION DRAIN OUTLETS  
DESIGNED TO MAINTAIN CLEARANCE BETWEEN  
VERTICAL AND HORIZONTAL REINFORCING BARS







# STEEL SCHEDULE

MARK	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	TOTAL FT.
B-1	CUT OFF	12	5	7-3	1			87.00
2		18	5	5-0	1			90.00
3		10	5	14-6	1			145.00
4		8	5	2-6	1			20.00
B-5		8	5	10-8	2	8-6	1-4	85.33
6		3	5	4-0	1			12.00
7		8	5	9-3	1			74.00
8		3	5	5-0	2	4-0	1-0	15.00
9		4	5	14-6	1			58.00
B-10	FLOOR SLAB	28	5	14-6	1			406.00
11		30	5	13-6	1			405.00
12		48	5	3-6	2	2-6	1-0	168.00
13	INLET WALL	8	5	8-7	2	6-1	2-6	68.67
14		5	5	6-6	2	4-0	2-6	39.00
B-15		15	5	10-6	1			157.50
16		6	5	4-9	2	3-9	1-0	28.50
17		8	5	3-0	1			24.00
18		6	5	2-3	1			13.50
19		3	5	3-4	2	2-0	1-4	10.00
B-20		3	5	3-0	2	2-0	1-0	9.00
21	WING WALLS	4	5	2-6	1			10.00
22		8	5	4-0	2	2-0	2-6	36.00
23	SIDE WALLS	10	5	7-10	2	6-6	1-4	72.32
24		14	5	6-6	1			91.00
B-25		8	5	5-6	1			44.00
26		8	5	4-6	1			36.00
27		8	5	3-6	1			28.00
28		16	5	12-0	1			192.00
29		4	5	10-3	1			41.00
B-30		4	5	8-0	1			32.00
31		6	5	5-6	1			33.00
32		4	5	9-1	3	7-6	1-7	36.33
33	BAFFLE	28	5	4-0	2	3-0	1-0	112.00
34		14	5	8-0	1			112.00
B-35		4	5	5-0	2	3-0	2-0	20.00
36		2	5	4-5	2	2-5	2-0	8.83
37		5	5	5-7	2	3-7	2-0	16.75
38		6	5	3-0	1			18.00
39		2	5	2-5	1			4.83
B-40		3	5	3-6	1			10.50
41		8	5	2-0	1			16.00

## BAR TYPES

## QUANTITIES THIS SHEET ONLY

REINFORCING STEEL  
NO 5 BARS 2776.52 LIN FT 2876 LBS

CONCRETE  
CLASS B 22 CU YDS

\* BARS CHANGED FROM ORIGINAL STEEL SCHEDULE

## AS BUILT PLANS

AS BUILT  
KAERCHER CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM PA-476  
BERKS COUNTY, PENNSYLVANIA  
IMPACT BASIN DETAILS  
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

## PLATE B

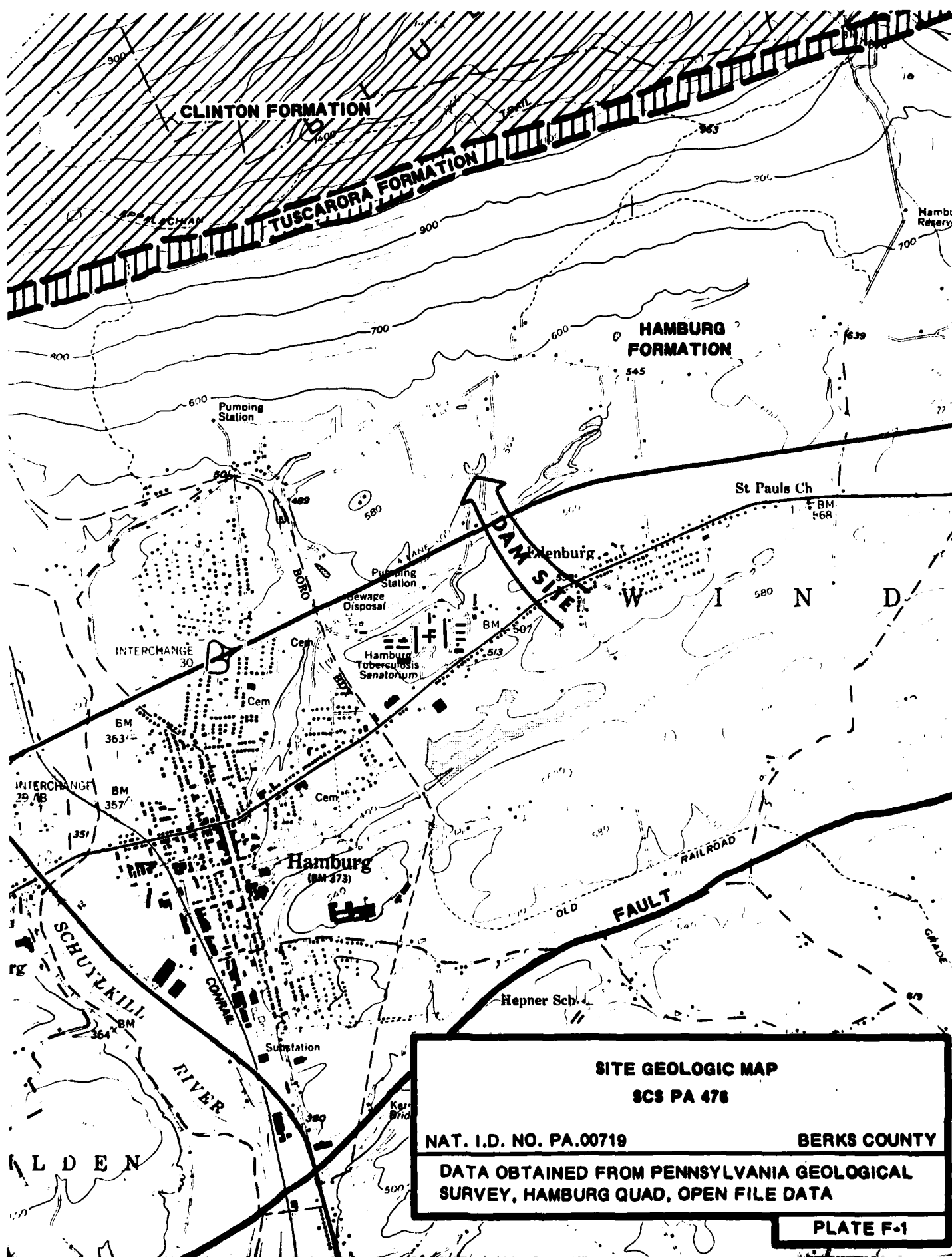
DATE	ITEM	APPROVED
11-20-66	IMPACT BASIN	APPROVED

**APPENDIX**

**F**

SITE GEOLOGY  
PA SCS 476

SCS PA 476 Dam is located in the Great Valley Section adjacent to the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. As shown in Plate F-1, the dam is constructed upon the Hamburg Formation of Ordovician age. Rocks of this formation consist primarily of shale and graywacke (impure sandstone). Information contained in SCS files describes the dam foundation to consist primarily of fractured and weathered sandstone, siltstone and shale. Bedding strike and dip are variable but generally strikes east-northeast and dips to the south approximately 45 degrees. Several bedrock outcrops were observed along the dam access road during the field inspection. The weathered zone reached to depths of 30 feet and is described as transmitting water readily. Above the weathered bedrock in the stream channel was a thin layer of alluvium grading laterally into colluvial soils at the abutments. The shallow fractured and broken nature of the bedrock along with its variable attitude could lead to possible future leakage.



**SITE GEOLOGIC MAP**

**SCS PA 476**

**NAT. I.D. NO. PA.00719**

**BERKS COUNTY**

**DATA OBTAINED FROM PENNSYLVANIA GEOLOGICAL  
SURVEY, HAMBURG QUAD, OPEN FILE DATA**

**PLATE F-1**